Appendix D
Boring Logs

Phase I
Boring Logs

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	FB-1 SHEET 1 OF 2

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design — LOCATION : (465021.0 N, 1280122.9 E)

ELEVATION : 151.7 ft — DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING METHOD AND EQUIPMENT : ATV, CME 55, 3-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : --- — START : 8/9/06 14:05 — END : 8/10/06 08:59 — LOGGER : K. Yang

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
151.7							
	1.0				**Clay* (CL)** Brown, moist, soft to medium stiff, medium plasticity, gray at top 6"		Down-hole UXO Clearance is performed every 1.5' for top 10', and every 5' until 20' PP = 1.25 - 2.5 tsf
	2.5	18.0	S1-SS	2-2-2 (4)			
	4.0	16.0	S2-SS	2-2-3 (5)	mottled with 3" thick black sand (organic potential), bottom 2" silty sand		PP = 1 tsf; LL = 27%, PL = 22%, PI = 5%; Water Content = 19.5% to 28.8%, Organic Content = 3.2%.
5							
146.7	5.5	17.0	S3-SS	4-3-3 (6)	**Silt* (ML)** Brown, moist, medium stiff, low plasticity, trace clay, trace sand and mica		PP = 1.5 - 2 tsf
	7.0	18.0	S4-SS	4-8-9 (17)	**Silty Sand* (SM)** Brown, moist, medium dense to dense, fine grained, possibly weathered rock, mottled black, trace gravel		
	8.5	16.0	S5-SS	5-7-14 (21)			
	10.0	14.0	S6-SS	10-20-22 (42)	Grayey brown, dense		
10							
141.7							
	13.5						
	13.9	5.0	S7-SS	50/5" (50/5")	**Sand* (SW)** Brown, wet to moist, very dense, fine to medium grained, mottled with dark brown, partially weathered rock		
15							
136.7							
	18.5						
	18.9	5.0	S8-SS	50/5" (50/5")	trace gravel		
20							
131.7							
	23.5						
	23.7	3.0	S9-SS	50/3" (50/3")	**Silty Sand* (SM)** Brown, wet, very dense, fine to medium grained		
25							
126.7							Grinding sound
	28.0						
					Begin Rock Coring at 28.0 ft below ground surface See the next sheet for the rock core log		
30							

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	FB-1 SHEET 2 OF 2

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design
LOCATION : (465021.0 N, 1280122.9 E)

ELEVATION : 151.7 ft
DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING METHOD AND EQUIPMENT : ATV, CME 55, NQ size double tube core barrel
ORIENTATION : Vertical

WATER LEVELS : ---
START : 8/9/06 14:05
END : 8/10/06 08:59
LOGGER : K. Yang

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	28.0		5	Medium rough, planar, flat to moderately dipping 0 - 45 degree joints from horizontal, no infilling, dark brown stained joint surface		**Gneiss*** Gray, fine to medium grained, slightly weathered, close spacing, highly weathered at 31.5', hard rock, can not be broken with 3 firm hits using geological hammer	Greenish water is leaking to surface; Coring rates: 3.3, 4, 5, 5, and 4 min/ft from 28' to 33'; Unconfined compressive strength = 6600 psi.
30 121.7	R1-NQ 5 ft 90%	68	3				
			2				
			3				
	33.0		1				
						Bottom of Boring at 33.0 ft below ground surface on 8/10/06 08:59	Water is encountered at 8.5' during boring; Water is 8' and cave-in is 26' at 8/10/2006 08:59 after rock coring; Water is 6.9' at 8/11/2006 13:08.
35 116.7							
40 111.7							
45 106.7							
50 101.7							
55 96.7							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	FPS-1 SHEET 1 OF 2

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design

LOCATION : (465234.6 N, 1279666.1 E)

ELEVATION : 156.8 ft

DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING METHOD AND EQUIPMENT : ATV, CME 55, 3-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : ---

START : 8/9/06 09:00

END : 8/9/06 13:10

LOGGER : K. Yang

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
156.8	0.0				**Concrete***		6" concrete pad
	1.5				**Sand* (SW)** Brown, moist, loose to medium dense, fine to coarse grained, well graded, trace gravel and clay		
	3.0	10.0	S1-SS	3-3-4 (7)			Down-hole Unexploded Ordinance (UXO) Clearance is made every 1.5' until 9', every 5' thereafter until 20'
	4.5	13.0	S2-SS	8-9-7 (16)			
5 151.8	6.0	13.0	S3-SS	5-5-4 (9)	**Gravelly Sand* (SW)** Brown, moist, loose, fine to coarse grained, little gravel, trace clay		
	7.5	14.0	S4-SS	4-6-6 (12)	**Silty Sand (SM)** Brown, moist to dry, medium dense, fine to medium grained, trace fine gravel and clay		Sand = 49.7%, Fines = 50.3%
	9.0	13.0	S5-SS	5-7-7 (14)	few 1.5" gravel, trace organic fiber		
10 146.8							
	13.5						Grinding sound from 11' to 13', possibly boulder is encountered
	15.0	10.0	S6-SS	9-5-3 (8)	**Sand* (SP)** Brown, moist to wet, loose to medium dense, fine to medium grained, 1" thick cemented sand, can be broken by finger, trace clay		Chloride = 13 ppm, pH = 5.06 su, Resistivity = 20800 ohm-cm, and Sulfate = 8 ppm.
15 141.8							
	18.5						
	20.0	14.0	S7-SS	2-16-13 (29)	wet, few cemented sand, can be broken by fingers, trace gravel (angular)		
20 136.8							
	23.2						Grinding sound from 21' - 23', possibly boulder or weathered rock, auger advanced slowly
25 131.8					Begin Rock Coring at 23.2 ft below ground surface See the next sheet for the rock core log		
30							

PROJECT NUMBER:	BORING NUMBER:	
339179.RD.FI	FPS-1	SHEET 2 OF 2

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design | LOCATION : (465234.6 N, 1279666.1 E)

ELEVATION : 156.8 ft | DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING METHOD AND EQUIPMENT : ATV, CME 55, NQ size double tube core barrel | ORIENTATION : Vertical

WATER LEVELS : --- | START : 8/9/06 09:00 | END : 8/9/06 13:10 | LOGGER : K. Yang

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
23.2			3	Slightly to medium rough, planar joint, discolored joint surface in dark brown, moderately dipping, 20 - 45 degree joints, no infilling, possible silt seams from 24'2" to 24'5" and from 27' to 27'2"		**Gneiss*** Gray (23'2" - 24'2"), brown (24'2" - 28'2"), fine to medium grained, moderately weathered to highly weathered, very close to close spaced joints, decomposed to soil at 28', hard rock(23'2" - 24'2"), soft rock (24'3" - 28'2"), can be broken with one slight hit using the point of geological hammer	No coring water return; Core barrel dropped 2" - 3" when it reached 24'2", possibly weak layer or voids; Coring rates: 3, 1.5, 2, 2, and 2 min/ft from 23'2" to 28'2".
25 131.8	R1-NQ 5 ft 92%	32	6				
			5				
			3				
28.2			>10				
			5	Medium rough, planar joints, moderately dipping, 20 - 45 degree from horizontal, thin to possible thick soil seams, dark brown stained joint surface		Gray, moderately weathered, close joint spacing, decomposed at 32', medium soft to hard rock	Coring rates: 2, 2, 2, 3, and 2 min/ft from 28'2" to 33'2".
30 126.8	R2-NQ 5 ft 83%	47	4				
			4				
			2				
33.2			>10				Driller noticed 6" of easy coring from 32'2" - 32'8", possibly soil seams
						Bottom of Boring at 33.2 ft below ground surface on 8/9/06 13:10	Temporary well was installed;
35 121.8							Water was around 18' during soil boring;
							Water is at 15' after coring 8/9/2006 13:10;
							Water is at 15.3' at 8/11/2006 12:56;
40 116.8							Water is at 15' at 9/13/2006 11:00.
45 111.8							
50 106.8							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	GCP-1 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (454468.1 N, 1284871.1 E)

ELEVATION : 139.3 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING METHOD AND EQUIPMENT : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead. 2" OD Split Spoon

WATER LEVELS : --- START : 8/11/06 13:00 END : 8/11/06 14:07 LOGGER : K. Yang

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
139.3	0.0						
		14.0	S-1-SS	5-7-8-14 (15)	**Silt (ML)** Brown, dry, stiff to very stiff, non to low plasticity, some sand, little clay		Topsoil 3"
	2.0						
		20.0	S-2-SS	10-11-14-15 (25)			PP = 4.5+ tsf
	4.0						
5		22.0	S-3-SS	6-9-11-14 (20)			PP = 4.5 + tsf Gravel = 0%, Sand = 30.6%, Silt = 58%, Clay = 11.4%.
134.3	6.0						
		22.0	S-4-SS	6-8-10-12 (18)			PP = 4.5+ tsf
	8.0						
		24.0	S-5-SS	7-10-15-17 (25)	**Silty Sand* (SM)** Reddish brown, dry to moist, medium dense, fine grained		
10	10.0						
129.3							
	13.5						
		14.0	S-6-SS	6-7-12 (19)			
15	15.0						
124.3							
	18.5						
		14.0	S-7-SS	35-33-48 (81)	**Silty Sand* (SM)** Gray, moist to dry, very dense, fine grained		
20	20.0						
119.3					Bottom of Boring at 20.0 ft below ground surface on 8/11/06 14:07		Dry during soil boring; Water is 16.8' and cave-in is 17.9' at the completion of boring, 8/11/2006 14:15; Water is 12.4' and cave-in is 16.8' at 8/14/2006, 07:20.
25							
114.3							
30							

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	GCP-2 SHEET 1 OF 2

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (454422.8 N, 1284904.0 E)

ELEVATION : 149.6 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING METHOD AND EQUIPMENT : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : --- START : 8/14/06 08:20 END : 8/14/06 09:45 LOGGER : K. Yang

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
149.6	1.0				**Gravel* (fill)**		Augered 1' gravel on surface
	3.0	15.0	S-1-SS	9-7-8-7 (15)	**Silt* (fill)** Brown, dry, stiff, low plasticity, top 3" gravel (fill), trace sand and clay		PP = 4.5 tsf
5	5.0	12.0	S-2-SS	2-5-4-6 (9)	dry to moist		PP = 1.75 - 2.5 tsf
144.6	7.0	11.0	S-3-SS	2-3-2-3 (5)	**Sandy Clay* (fill)** Grayey brown, moist, medium stiff, medium plasticity, trace gravel and silt, little sand		PP = 1.25 - 2.0 tsf; Water Content = 20.6%.
	9.0	11.0	S-4-SS	2-2-2-2 (4)	low plasticity		PP = 0.75 - 1.25 tsf
10	11.0	14.0	S-5-SS	2-3-3-3 (6)	Gray interval with brown		PP = 0.75 - 2.0 tsf
139.6	13.5						
15	15.0	18.0	S-6-SS	7-11-13 (24)	**Silt* (ML)** Brown, dry, very stiff, low plasticity, trace clay, sand, and gravel		PP = 4.0 - 4.5+ tsf
134.6	18.5						
20	20.0	17.0	S-7-SS	9-11-14 (25)	**Sandy Silt (ML)** Reddish brown, dry to moist, very stiff, non plasticity, trace a few pieces of rock fragments up to 1".		Gravel = 0.9%, Sand = 38.3%, Fines = 60.8%, Water Content = 21.4%.
129.6	23.5						
25	25.0	14.0	S-8-SS	8-11-13 (24)	Mottled with dark brown		
124.6	28.5						
30	30.0	14.0	S-9-SS	12-13-13 (26)	Gray brown mottled with black, wet		

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	GCP-2 SHEET 2 OF 2

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design

LOCATION : (454422.8 N, 1284904.0 E)

ELEVATION : 149.6 ft

DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING METHOD AND EQUIPMENT : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : ---

START : 8/14/06 08:20

END : 8/14/06 09:45

LOGGER : K. Yang

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
119.6					**Silty Sand* (SM)** Grayey brown, wet, very dense, trace rock fragments, partially weathered rock		
33.5 33.7	3.0	S-10-SS		50/3" (50/3")			
35 114.6							
38.5 38.6	1.5	S-11-SS		50/1.5" (50/1.5")	**Gravel* (SP)** Gray, wet, very dense, angular, coarse Bottom of Boring at 38.6 ft below ground surface on 8/14/06 09:45		Water is encountered at 27.9' during soil boring; Auger Refusal at 38.6'; The hole is grouted using cement - water - bentonite grout right after the completion of boring.
40 109.6							
45 104.6							
50 99.6							
55 94.6							
60							

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	GCP-3 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (454719.1 N, 1285171.7 E)

ELEVATION : 136.1 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING METHOD AND EQUIPMENT : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : --- START : 8/14/06 07:25 END : 8/14/06 08:00 LOGGER : K. Yang

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
136.1	0.0						
		20.0	S-1-SS	4-9-10-8 (19)	**Silt* (ML)** Brown, dry, stiff to very stiff, non plasticity		3" Topsoil with grass roots
	2.0						
		18.0	S-2-SS	6-6-8-12 (14)			PP = 4.5+ tsf
	4.0						
5		20.0	S-3-SS	11-17-16-14 (33)	**Sandy Silt* (ML)** Brown, dry, hard, non plasticity, little sand		PP = 4.5+ tsf Chloride = 9 ppm, pH = 4.64 su, Resistivity = 9700 ohm-cm, and Sulfate = 25 ppm.
131.1	6.0						
		21.0	S-4-SS	6-10-13-15 (23)	**Clayey Silt* (ML)** Grayey brown, dry, very stiff, low plasticity, little clay		
	8.0						
		24.0	S-5-SS	7-8-9-11 (17)			PP = 4.0 - 1.5 tsf decrease with depth
10	10.0				**Silty Clay* (CL)** Grayey brown, moist, very stiff, low plasticity		
126.1							
	13.5						
		21.0	S-6-SS	6-9-15 (24)	**Clayey Silt* (ML)** Grayey brown, dry to moist, very stiff, low plasticity		PP = 4.0 - 4.5+ tsf
15	15.0						
121.1							
	18.5						
		13.0	S-7-SS	4-9-8 (17)	**Clayey Sand* (SC)** Grayey brown, moist, medium dense, few clay, trace gravel		PP = 0.75 - 3.25 tsf
20	20.0						
116.1					Bottom of Boring at 20.0 ft below ground surface on 8/14/06 08:00		No water is encountered during boring; Dry and 17'5" cave- in at 8/14/2006 08:25, i.e. end of boring; water is 6'10" and cave-in is 13'3" at 8/15/2006 08:05.
25							
111.1							
30							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
339179.RD.FI	GCP-4	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design — LOCATION : (454677.9 N, 1285202.4 E)

ELEVATION : 149.1 ft — DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : --- — START : 8/14/06 12:00 — END : 8/14/06 14:35 — LOGGER : K. Yang

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
149.1	1.0				**Gravel* (fill)** Gray		Augered 1' at the top of roadway/dike. An electric line (3-1/4 diameter) is around 1.5' away from the boring.
	3.0	14.0	S-1SS	5-8-5-5 (13)	**Silt And Sand (fill)** Brown, dry, stiff, trace gravel		
	5.0	14.0	S-2SS	3-4-4-3 (8)	moist, loose, little clay		PP = 1 - 2.5 tsf Sand=40.1%, silt=41.5%, and clay=18.3%
5 144.1	7.0	13.0	S-3SS	2-3-3-3 (6)			PP = 4 - 1.25 tsf decrease with depth
	9.0	19.0	SB-1ST		**Sandy Clay* (fill)** Brown and Grayey Brown, moist, soft, medium plasticity		PP = 0.5 tsf at the bottom of shelby tube
10 139.1	11.0	14.0	S-5SS	1-2-2-1 (4)	Grayey Brown, moist, soft, medium plasticity, trace gravel, soft interval with medium stiff possibly due to inconsistent compaction or no compaction		PP = 0.375 - 1.25 tsf
	13.5						
15 134.1	15.0	13.0	S-6SS	1-2-3 (5)	Brown, moist, soft to medium stiff, low to medium plasticity		PP = 0 - 1.25 tsf a thin (1" - 2") soft layer with PP = 0 - 0.25 tsf at depth of 14.5'
	18.5						
20 129.1	20.0	17.0	S-7SS	6-9-13 (22)	**Silty Clay* (CL)** Gray, moist to dry, very stiff, medium plasticity		PP = 3.5 - 4.5+ tsf
	23.5						
25 124.1	25.0	18.0	S-8SS	4-6-6 (12)	medium plasticity, stiff to soft (bottom of sample)		PP = 4.0 - 0.5 tsf decrease with depth
	28.5						
30	30.0	18.0	S-9SS	7-9-12 (21)	**Sandy Clay* (CL)** Gray, dry to moist, very stiff, medium plasticity, trace gravel and mica		PP = 3.0 - 4.5 tsf

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	GCP-4 SHEET 2 OF 2

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (454677.9 N, 1285202.4 E)

ELEVATION : 149.1 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : --- START : 8/14/06 12:00 END : 8/14/06 14:35 LOGGER : K. Yang

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
119.1							
	33.5						
		16.0	S-10SS	5-50/5.5" (50/5.5")	**Silty Sand* (SM)** Brown mottled with Dark Brown, wet, very dense, fine grained, partially weathered micaceous rock		
35	35.0						
114.1							
	38.5						
	38.7	2.5	S-11SS	50/2.5" (50/2.5")			bouncing of sampling rod
40							
109.1							
	43.5						
	43.7	3.0	S-12SS	50/3" (50/3")	trace gravel		
45							
104.1							grinding sound of steel on hard material, possibly weathered rock fragments
	48.5						
		14.0	S-13SS	46-45-36 (81)	trace gravel		
50	50.0						
99.1					Bottom of Boring at 50.0 ft below ground surface on 8/14/06 14:35		Water is encountered at 30' during boring; the hole is grouted using cement - water - bentonite grout right after boring; water is 40' at 8/14/2006 14:35, i.e. end of rock coring.
55							
94.1							
60							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
339179.RD.FI	GPS-1	SHEET 1 OF 3

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design

LOCATION : (454255.6 N, 1284854.1 E)

ELEVATION : 145.1 ft

DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING METHOD AND EQUIPMENT : ATV, CME 55, 3-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : ---

START : 8/10/06 11:10

END : 8/10/06 15:34

LOGGER : K. Yang

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
145.1	0.0						
		20.0	S-1-SS	9-38-16-9 (54)	**Silty Gravel* (fill)** White/brown, dry, very dense, subangular		2" topsoil
	2.0						
		20.0	S-2-SS	2-5-4-5 (9)	**Clayey Gravel* (fill)** Brown, dry, loose, subrounded		
	4.0						
5		18.0	S-3-SS	3-3-5-9 (8)	**Clay* (possible Fill) (CL)** Reddish brown, dry, medium stiff, low to medium plasticity, little gravel		PP = 2.0 - 3.0 tsf grinding sound
140.1	6.0						
		20.0	S-4-SS	3-4-6-7 (10)	**Silty Clay* (possible Fill) (CL)** Brown, dry to moist, stiff, low to medium plasticity		PP = 1.5 - 2.75 tsf
	8.0						
		20.0	S-5-SS	9-10-10-13 (20)	**Clayey Silt* (ML)** Brown, dry, very stiff, low plasticity		PP = 3.25 - 4.25 tsf
10	10.0						
135.1							PP = 2.5 - 4.5+ tsf
	13.0						
		18.0	S-6-SS	4-7-11 (18)	Brown mottled dark brown, few gravel		
	14.5						
15							
130.1							
	18.0						
		15.0	S-7-SS	3-6-8 (14)	**Sandy Silt* (ML)** Brown, moist, stiff to very stiff, low plasticity		
	19.5						
20							
125.1							
	23.0						
		17.0	S-8-SS	10-10-9 (19)			
	24.5						
25							
120.1							
	28.0						
		14.0	S-9-SS	23-34-50/4" (84/10")	**Silty Sand (SM)** Grayey brown, wet, very dense, fine grained, partially weathered rock		Sand = 68.1%, Fines = 31.9%.
	29.4						
30							

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	GPS-1 SHEET 2 OF 3

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (454255.6 N, 1284854.1 E)

ELEVATION : 145.1 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING METHOD AND EQUIPMENT : ATV, CME 55, 3-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : --- START : 8/10/06 11:10 END : 8/10/06 15:34 LOGGER : K. Yang

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
115.1							
	33.0						
33.9		11.0	S-10-SS	22-50/4.5" (50/4.5")	mottled with dark brown		
35 110.1							
38.0 38.5		0.0	S-11-SS	50/1" (50/1")	**No Recovery** Begin Rock Coring at 38.5 ft below ground surface See the next sheet for the rock core log		Rod is bouncing when sampling Auger Refusal at 38.5'
40 105.1							
45 100.1							
50 95.1							
55 90.1							
60							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
339179.RD.FI	GPS-1	SHEET 3 OF 3

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design — LOCATION : (454255.6 N, 1284854.1 E)

ELEVATION : 145.1 ft — DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING METHOD AND EQUIPMENT : ATV, CME 55, NQ size double tube core barrel — ORIENTATION : Vertical

WATER LEVELS : --- — START : 8/10/06 11:10 — END : 8/10/06 15:34 — LOGGER : K. Yang

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R.Q.D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
38.5			2	Medium rough, planar, flat to gently dipping, 0 - 15 degree from horizontal joints, some dark brown stained joint surface, no infilling		**Gneiss*** Gray, fine to medium grained, slightly weathered, close to moderate to close spacing, hard rock (need more than 1 firm geological hammer blow)	Gray color water loss on surface
40			2				
105.1	R-1-NQ 5 ft 97%	95	0				Mechanical joints at 40.6', 43.7' and 44.5';
			0				Coring rates: 4.7, 4.3, 4.8, 4.3, and 4.8 min/ft from 38.5' - 43.5'
43.5			1				
			0	moderately dipping, 30 - 45 degree from horizontal, dark brown stained joints		slightly weathered to unweathered, moderately close spacing	
45			0				
100.1	R-2-NQ 5 ft 100%	95	2				Coring rates: 5.4, 5.0, 5.5, 6.2, and 6.7 min/ft from 43.5' - 48.5'
			1				
48.5			0				
						Bottom of Boring at 48.5 ft below ground surface on 8/10/06 15:34	Water is encountered at 27' during boring;
50							
95.1							Water is 15.5' and cave-in is 22.5' at 8/10/2006 15:34 after rock coring;
							Water is 20'4" and cave-in 30'5" at 8/11/2006 14:15.
55							
90.1							
60							
85.1							
65							
80.1							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
339179.RD.FI	GPS-2	SHEET 1 OF 3

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design — LOCATION : (454280.6 N, 1284833.2 E)

ELEVATION : 141.9 ft — DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING METHOD AND EQUIPMENT : ATV, CME 55, 3-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : --- — START : 8/11/06 07:30 — END : 8/11/06 12:15 — LOGGER : K. Yang

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
141.9	0.0						
		16.0	S1-SS	35-17-10-12 (27)	**Clayey Gravel* (fill)** Gray, dry, medium dense		3" topsoil
	2.0						
		17.0	S2-SS	27-20-3-4 (23)			
	4.0				**Clay* (fill)** Brown, dry, medium stiff, medium plasticity		
5							PP = 1 - 1.5 tsf
136.9		15.0	S3-SS	2-1-2-1 (3)	**Sandy Clay* (possible Fill) (CL)** Brown, moist, soft to medium stiff, low plasticity, trace gravel		
	6.0						
		17.0	SB1-ST				A Shelby Tube sample is taken from 6' to 8'; Triaxial CU test provided: c' = 258 psf, effective friction angle = 26.5 degree, undrained shear strength Su = 930 psf at confining pressure of 1 ksf, and Su = 1312 psf at confining pressure of 2 ksf.
	8.0						
		15.0	S5-SS	2-3-3-3 (6)			PP = 0.5 - 1.0 tsf;
10	10.0						LL = 38%, PL = 18%, PI = 20%, Water content = 21.1%.
131.9							
	13.5						
		17.0	S6-SS	4-7-7 (14)	**Silty Sand* (SM)** Reddish brown to grayey brown, moist, medium dense to dense, fine grained, micaceous decomposed rock		
15	15.0						
126.9							
	18.5						
		16.0	S7-SS	10-16-21 (37)			
20	20.0						
121.9							
	23.5						
		15.0	S8-SS	9-10-14 (24)			
25	25.0						
116.9							
	28.5						
		15.0	S9-SS	11-14-24 (38)	wet		
30	30.0						

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	GPS-2 SHEET 2 OF 3

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (454280.6 N, 1284833.2 E)

ELEVATION : 141.9 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING METHOD AND EQUIPMENT : ATV, CME 55, 3-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : --- START : 8/11/06 07:30 END : 8/11/06 12:15 LOGGER : K. Yang

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
111.9							
					Silty Sand* (SM) Grayey brown, wet, fine grained		
	33.5						
	34.4	10.0	S10-SS	25-50/5.5" (50/5.5")	very dense, partially weathered rock		
35 106.9							
	38.5						
	38.8	3.0	S11-SS	50/3" (50/3")			
40 101.9							
	42.0				Begin Rock Coring at 42.0 ft below ground surface See the next sheet for the rock core log		
45 96.9							
50 91.9							
55 86.9							
60							

PROJECT NUMBER:	BORING NUMBER:	
339179.RD.FI	GPS-2	SHEET 3 OF 3

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design | LOCATION : (454280.6 N, 1284833.2 E)

ELEVATION : 141.9 ft | DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING METHOD AND EQUIPMENT : ATV, CME 55, NQ size double tube core barrel | ORIENTATION : Vertical

WATER LEVELS : --- | START : 8/11/06 07:30 | END : 8/11/06 12:15 | LOGGER : K. Yang

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	42.0		2	Medium rough, planar, flat to moderately dipping, 0 - 45 degree from horizontal, reddish brown stained joint surface, no infilling, possibly 3 sets of joints, 0, 45, -45 degree orientation,		**Gneiss*** Gray, fine to medium grained, slightly weathered, very close to close joint spacing, decomposed at 45', hard rock	Gray color water is leaking on surface; Coring rates: 5.8, 5.1, 7, 5.1, and 6.6 min/ft from 42' to 47'; Unconfined compressive strength = 4450 psi. Water loss in borehole when core barrel is 45';
			4				
	R1-NQ 5 ft 100%	42	5				
45 96.9			6				
	47.0		4				
			3			slightly weathered to unweathered	Coring rates: 4.6, 5.8, 5.8, 5.5, and 6 min/ft from 47' to 52'.
			2				
	R2-NQ 5 ft 100%	72	5				
50 91.9			3				
	52.0		1				
						Bottom of Boring at 52.0 ft below ground surface on 8/11/06 12:15	Water is encountered at 27.6' during boring; A temporary well was installed; Water is 20' after rock coring at 8/11/2006 12:22; Water is 20.4' at 8/15/2006 8:07; Water is 20.3' at 8/18/2006 14:20; Water is 19.5' at 9/13/2006 11:45.
55 86.9							
60 81.9							
65 76.9							
70 71.9							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	PS-1 SHEET 1 OF 3

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (462250.0 N, 1280081.5 E)

ELEVATION : 145.8 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING METHOD AND EQUIPMENT : ATV, CME 55, 3-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : --- START : 8/15/06 09:30 END : 8/15/06 13:08 LOGGER : K. Yang

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
145.8	1.0				**Silty Sand* (fill)** Brown, dry, medium dense, fine grained, trace gavel		Augered 1' to avoid surface gravel
	3.0	19.0	S1-SS	8-12-15-19 (27)			Grinding sound, possibly cobbles/boulders
5	5.0	10.0	S2-SS	10-11-8-8 (19)			
140.8	7.0	16.0	S3-SS	5-4-11-8 (15)	**Sandy Clay* (fill)** Brown, dry, stiff, low plasticity, trace gravel, bottom 4" sandy gravel		PP = 2 - 3 tsf Chloride = 11 ppm, pH = 7.3 su, Resistivity = 7120 ohm-cm, Sulfate = 14 ppm.
	9.0	13.0	S4-SS	4-5-7-6 (12)	**Silty Sand* (fill)** Brown, dry, medium dense, fine grained, trace gravel		
10 135.8	11.0	11.0	S5-SS	3-3-4-5 (7)	**Sandy Clay* (fill)** Brown, dry to moist, medium stiff, low plasticity, trace gravel and black organic fiber		PP = 1 - 1.5 tsf; Water Content = 19.1%; Organic Content = 1%.
	13.5						
15	15.0	10.0	S6-SS	4-8-6 (14)	**Silty Sand* (possible Fill) (SM)** Grayey brown, dry to moist, loose to medium dense, fine grained, few gravel up to 1" size		
130.8	18.5						Grinding sound, possibly cobbles
20	20.0	11.0	S7-SS	3-3-3 (6)	moist, loose		
125.8	23.5						
25	25.0	14.0	S8-SS	9-10-16 (26)	moist, medium dense, no gravel		
120.8	28.5						
30	30.0	13.0	S9-SS	20-24-28 (52)	**Silty Sand* (SM)** Grayey brown, moist, very dense, fine grained		

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	PS-1 SHEET 2 OF 3

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (462250.0 N, 1280081.5 E)

ELEVATION : 145.8 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING METHOD AND EQUIPMENT : ATV, CME 55, 3-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : --- START : 8/15/06 09:30 END : 8/15/06 13:08 LOGGER : K. Yang

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
115.8							Grinding sound, rock fragments
33.5 33.6 34.1	1.5	S10-SS		50/1.5" (50/1.5")	**Sandy Gravel* (GP)** Gray, dry, very dense, possibly weathered rock, angular Begin Rock Coring at 34.1 ft below ground surface See the next sheet for the rock core log		Bouncing of sampling rod
35 110.8							
40 105.8							
45 100.8							
50 95.8							
55 90.8							
60							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
339179.RD.FI	PS-1	SHEET 3 OF 3

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design

LOCATION : (462250.0 N, 1280081.5 E)

ELEVATION : 145.8 ft

DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING METHOD AND EQUIPMENT : ATV, CME 55, NQ size double tube core barrel

ORIENTATION : Vertical

WATER LEVELS : ---

START : 8/15/06 09:30

END : 8/15/06 13:08

LOGGER : K. Yang

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
34.1							
35			2	Slightly rough to medium rough bedding joint surface, flat to moderately dipping (0, +45 - 45 degree), very narrow to tide, stained, infilling in brown color, no voids		**Gneiss*** Gray, fine to medium grained, slightly weathered to fresh, mottled with brown from 34.1' to 36', medium bedding, close joint spacing, medium soft to hard	Circulating gray water; Water lost on surface when core barrel is at 36'; Coring rates: 5.6, 4.3, 4.5, 5, and 5.8 min/ft from 34.1' to 39.1'.
110.8			2				
	R1-NQ 5 ft 100%	90	1				
			2				
			1				
39.1							
40			0	medium rough bedding or joints, moderately dipping (+/- 45 degree), generally thin to medium bedding, very close to close joint spacing, generally narrow separation, wide to very wide separation from 42.5' to 43.5', some stained infilling in dark brown color		Gray mottled with light brown, slightly weathered to moderately weathered, decomposed rock pieces from 42.5' to 42.8'. Possible 5" of decomposed rock infilling is washed out by water at depth 42.5'	Unconfined Compressive Strength = 6630 psi; Unusual noise came out from coring at 39.5'. Noise is gone after 1 min; Coring rates: 4, 5.6, 4.6, 4.5, and 5 min/ft from 39.1' to 44.1'.
105.8			5				
	R2-NQ 5 ft 92%	55	3				
			>10				
44.1			5				
45						Bottom of Boring at 44.1 ft below ground surface on 8/15/06 13:08	No water is encountered before rock coring; Water is 11'8" and cave-in is 31'10" at 8/15/2006 13:05 after rock coring; Water is 20'4" at 8/18/2006 14:00.
100.8							
50							
95.8							
55							
90.8							
60							
85.8							

Phase II
Boring Logs

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-01 SHEET 1 OF 3

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (462997.4 N, 1281387.5 E)

ELEVATION : 218.8 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : Truck Mounted, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 32.0 ft below ground surface START : 3/12/07 07:45 END : 3/12/07 15:30 LOGGER : L. Seraydarian

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
218.8	0.0 1.0	8.0	S1SS	2-3	**Top Soil*** brown, dry, grass, roots, (fill)		PP=1 tsf
	2.0	1.0	S2SS	4-4	**Silt* (ML)** brown, dry, medium stiff, nonplastic, (fill)		
	3.0	6.0	S3SS	3-5			PP=0.5 tsf PID=0
	4.0	5.0	S4SS	8-12	trace sand		PP=1.5 tsf
5	5.0	1.0	S5SS	10-7			PID=0
213.8	6.0	9.0	S6SS	5-8	estimated 5% clays & 5% coarse sand		PP=1.25 tsf
	7.0	12.0	S7SS	14-19	**Elastic Silt (MH)** brown, dry, very stiff, low plasticity, little coarse sand, asphalt chips, few gravel up to 0.5 in diameter, trace clay (fill)		PP=1.5 tsf PID=0 Gravel = 10.7%, Sand = 24.9%, fines = 64.4 %
	8.0	6.0	S8SS	12-11			
	9.0	4.0	S9SS	9-13	**Fine Sand W/ Mica* (SP)** brown, dry, loose, (fill)		
10	10.5	12.0	S10SS	7-6-7 (13)	**Silt W/fine Sand* (ML)** brown, moist, stiff, slightly plasticity, 5% clay (fill)		
208.8	13.5						Note: Split spoon was sampled every 1 ft for top 10 ft due to Unexploded Ordnance (UXO) check. UXO check was performed every 1 ft from 0 to 10 ft and at 13.5, 18.5, and 23.5 ft. No UXO interference was detected. No elevated Photo Ionisation Detector (PID) readings.
15	15.0	6.0	S11SS	3-4-6 (10)	**Sand W/ Silt* (SP-SM)** light brown, moist, loose, estimated 10% silt (fill)		
203.8	18.5						
20	20.0	15.0	S12SS	31-37-31 (68)	**Poorly Graded Sand* (SP)** light brown, dry, very dense, fine to medium grained, estimated 5% silt, 15% coarse sand		
198.8	23.5						
25	25.0	12.0	S13SS	7-20-26 (46)	**Well Graded Sand* (SW)** light brown, dry, dense, trace silt		
193.8	28.5						
30	28.6	0.0	S14SS	50/1 (50/1")	No recovery, partially weathered rock		

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-01 SHEET 2 OF 3

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (462997.4 N, 1281387.5 E)

ELEVATION : 218.8 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : Truck Mounted, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 32.0 ft below ground surface START : 3/12/07 07:45 END : 3/12/07 15:30 LOGGER : L. Seraydarian

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
188.8					**Well Graded Sand* (SW)** light brown, dry, dense, trace silt, partially weathered rock		
33.5							
33.6	1.0	S15SS		50/1 (50/1")			
35 183.8							
38.5							
38.7	2.0	S16SS		50/2 (50/2")	**Micaceous Silty Sand (SM)** gray brown, damp, very dense, fine to medium grained sand		water was encountered at 38' bgs Auger refusal at 41 ft bgs 41' auger refusal
40 178.8							
41.0					Begin Rock Coring at 41.0 ft below ground surface See the next sheet for the rock core log		
45 173.8							
50 168.8							
55 163.8							
60							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
339179.RD.FI	BH-01	SHEET 3 OF 3

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design — LOCATION : (462997.4 N, 1281387.5 E)

ELEVATION : 218.8 ft — DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING EQUIPMENT AND METHOD : Truck Mounted, CME 55, NQ size double tube core barrel — ORIENTATION : Vertical

WATER LEVELS : 32.0 ft below ground surface — START : 3/12/07 07:45 — END : 3/12/07 15:30 — LOGGER : L. Seraydarian

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R.Q.D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
41.0			2	Fractures, 10 deg and 60 deg, medium rough, clay infilling, brown, joint color is rust brown, no voids,solid clay infilling at 44.8' tight narrow		**Gneiss*** gray, medium soft, coarse sand to medium sand, slightly weathered, black mica, plagioclage feldspar, quartz	Rock coring rates (min/ft): 4/3/3/3/2.8 Unconfined compressive strength (UCS) = 5203 psi
	R1NQ 4.5 ft 100%	78	3				
			1				
45			2				
173.8	45.5		1				
			2	Fractures, 10 deg and 65 deg, slight to medium rough, clay infilling, at 46.5' bgs tight narrow, rust brown to black color in fractures, no voids		hard, coarse sand, slightly weathered, close joint spacing	Rock coring rates (min/ft): 3.3/3.1/3.2/4.1
	R2NQ 5 ft 100%	73	3				
			1				
			4				
50			1				
168.8	50.5						
			1	Fractures, vertical and vertical, joint color is rust brown infilling less than 1 mm at 52'bgs, 53'bgs, 54.5'bgs. clay solid, no void		medium sand to coarse sand, slightly weathered, close joint spacing	Rock coring rates (min/ft): 3.5/3.5/4/3/4.43
	R3NQ 5 ft 100%	80	2				
			0				
			4				
55			3				
163.8	55.5						
						Bottom of Boring at 55.5 ft below ground surface on 3/12/07 15:30	1. Water was encountered at 38' bgs during drilling; 2. Water was at 32 ft bgs after rock coring.
60							
158.8							
65							
153.8							
70							
148.8							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-02 SHEET 1 OF 2

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463110.0 N, 1281389.4 E)

ELEVATION : 217.9 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : Truck Mounted, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : --- START : 3/13/07 07:45 END : 3/15/07 15:30 LOGGER : L. Seraydarian

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
217.9	0.0 1.0	8.0	S1SS	2-6	**Top Soil*** brown, dry, grass (fill)		
	2.0	6.0	S2SS	2-5	**Elastic Silt* (MH)** brown, moist, stiff, low plasticity, estimated 10% clay, 5% fine sand (fill)		PP=0.5 tsf
	3.0	8.0	S3SS	2-3			PP=2.25 tsf
	4.0	3.0	S4SS	4-5			PP=0.5 tsf PID=0
5	5.0	3.0	S5SS	2-2	estimated 10% sand , 25% clay		PP=0.5 tsf
212.9	6.0	10.0	S6SS	7-11	**Lean Clay* (CL)** brown, moist, stiff to very stiff, fine grained, very low plasticity, estimated 25% silt, trace fine sand (fill)		PP=0.75 tsf
	7.0	11.0	S7SS	12-11			PP=2 tsf
	8.0	9.0	S8SS	16-19	brick fragments		PP=1.25 tsf
	9.0	11.0	S9SS	26-40	**Sandy Silt (ML)** brown, moist, hard, medium plasticity, trace asphalt chunks, brick, wood, and ash, (fill)		PP=0.75 tsf. Sand = 25.8%, silt = 73.6 %, clay = 0.6%. LL=42, PL=25, and PI=17
10 207.9	10.5	14.0	S10SS	30-25-35 (60)			PP=0.75 tsf
	13.5						Note: Split spoon was sampled every 1 ft for top 10 ft due to Unexploded Ordnance (UXO) check. UXO check was performed every 1 ft from 0 to 10 ft and at 13.5, 18.5, and 23.5 ft. No UXO interference was detected. No elevated Photo Ionisation Detector (PID) readings.
	14.6	4.0	S11SS	35-22-15 (37)	**Silty Sand* (SM)** brown, moist, dense, some mica, weathered rock, (fill)		
15 202.9					Begin Rock Coring at 14.6 ft below ground surface See the next sheet for the rock core log		
20 197.9							
25 192.9							
30							

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-02 SHEET 2 OF 2

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design — LOCATION : (463110.0 N, 1281389.4 E)

ELEVATION : 217.9 ft — DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING EQUIPMENT AND METHOD : Truck Mounted, CME 55, NQ size double tube core barrel — ORIENTATION : Vertical

WATER LEVELS : --- — START : 3/13/07 07:45 — END : 3/15/07 15:30 — LOGGER : L. Seraydarian

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R.Q.D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
15 202.9	14.6		2	14'9 to 16'10: Mechanical Break		**Gneiss* (BOULDER)** very dark bluish gray (Gley 2 3/1 10B) when it is wet, light bluish gray (Gley 2 8/1 5B) when it is dry, hard, medium sand to coarse sand, slightly weathered, close to moderate close spacing	16.10'-17.0' break through, possible soil layer between boulders
	R1NQ 5 ft 77%	53	0 4 3	medium rough, gently to moderately dipping, some brown staining, thin sand infilling, narrow separation			18.4'-18.8' break through
20 197.9	19.6						20.2'-21.4' break through
	R2NQ 5 ft 40%	32					22.0'-22.10' break through 23.1'-23.11' break through 24.4'-24.8' break through
25 192.9	24.6			steeper dipping			
	R3NQ 5 ft 47%	18					27.4' break through
30 187.9	29.6					**Soil*** Assumed soil or completely weathered rock	
	R4NQ 5 ft 0%	0					Note: 1. Unable to core through at 39.6' bgs, possible bedrock. 2. A few pieces of rock fragments were retrieved at bottom of the hole. 3. UXO detection was performed at 39'6 bgs, and no UXO interference. 4. Bore hole location offset 3 times. Refusal Encountered at 12.5', 18' and 14.5' bgs
35 182.9	34.6						
	R5NQ 5 ft 0%	0					
40 177.9	39.6					Bottom of Boring at 39.6 ft below ground surface on 3/15/07 15:30	Note: 1. Bottom of core at 39.6' bgs, No water was encountered during drilling; 2. Dry and cave-in at 13.5 ft bgs 3/19/2007

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-03 SHEET 1 OF 3

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463237.4 N, 1281390.8 E)

ELEVATION : 213.3 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : Truck Mounted, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : --- START : 3/14/07 10:45 END : 3/14/2007 LOGGER : L. Seraydarian

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
213.3	0.0						
	1.0	3.0	S1SS	3-2	**Top Soil*** dry, grass roots, silt w/ fine sand, estimeted 5% clay (fill)		
	2.0	4.0	S2SS	3-4	**Elastic Silt* (MH)** brown, moist, medium stiff to very stiff, fine grained, low plasticity, estimated 10% clay (fill)		
	3.0	4.0	S3SS	2-3			PP=0.25 tsf
	4.0	6.0	S4SS	4-5			
5	5.0	3.0	S5SS	15-11	very stiff, with black chunks and sand size particles of asphalt, unconsolidated		
208.3	6.0	5.0	S6SS	14-20	with hard chunks of aqua colured fibrous material		PP=1.25 tsf
	7.0	6.0	S7SS	15-15	brick fragments		Moisture Content = 12%, organic matter = 1.7% PP=1.0 tsf
	8.0	2.0	S8SS	13-12			
	9.0	2.0	S9SS	3-3			
10	10.5	11.0	S10SS	3-3-4 (7)	asphalt chunks		PP=1.75 tsf
203.3	13.5						Note: Split spoon was sampled every 1 ft for top 10 ft due to Unexploded Ordnance (UXO) check. UXO check was performed every 1 ft from 0 to 10 ft and at 13.5, 18.5, and 23.5 ft. No UXO interference was detected. No elevated Photo Ionisation Detector (PID) readings.
	13.6						
	14.0	0.0	S11SS	50/1 (50/1")	Begin Rock Coring at 14.0 ft below ground surface See the next sheet for the rock core log		Auger refusal were encountered at 5 locations within a 20 ft by 5 ft area. The refusal depths were 18 ft, 17.5 ft, 17.5 ft, 14.5 ft, and 14 ft. Likely a big size boulder was encountered.
15							
198.3							
20							
193.3							
25							
188.3							
30							

PROJECT NUMBER:	BORING NUMBER:	
339179.RD.FI	BH-03	SHEET 2 OF 3

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design — LOCATION : (463237.4 N, 1281390.8 E)

ELEVATION : 213.3 ft — DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING EQUIPMENT AND METHOD : Truck Mounted, CME 55, NQ size double tube core barrel — ORIENTATION : Vertical

WATER LEVELS : --- — START : 3/14/07 10:45 — END : 3/14/2007 — LOGGER : L. Seraydarian

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	14.0		3	Fracture, medium rough to smooth, 10 to 45 degree. potential void from 14.5'-15.5' bgs		**Gneiss* (BOULDER)** light gray, (Gley 1 7/N), medium sand to coarse sand, slightly weathered, hard , moderately close spacing	Rock coring rates (min/ft): 2,0,3,4,3
15 198.3	R1NQ 5 ft 62%	50	void				
			3				
			1	Fracture, 45 deg, smooth slightly rough, rust brown, very tight, solid, no voids			Soils were washed away during coring. Unconfined compressive strength (UCS) = 12979 psi
	19.0		1				
20 193.3	R2NQ 5 ft 32%	0				**Soil*** Possible fill and residual soils	
	24.0						
25 188.3	R3NQ 5 ft 0%	0					
	29.0						
30 183.3	R4NQ 2.5 ft 0%	0					
	31.5			soil and partially weathered rock			
35 178.3	R5NQ 5 ft 0%	0					
	36.5		10+	very rough, 10 to 90 deg. vertical fractures		**Gneiss*** dark yellowish brown, (10YR 4/4), medium sand to coarse sand, completely weathered gneiss, breaks apart in hand w/strong light pressure. very close spacing	Rock coring rates (min/ft): 1,1,1,1
	R6NQ 4 ft 100%	0	10+				
			5				
40 173.3	40.5		5				
			6				
	R7NQ 5 ft 30%	0	3	extremely weathered rock was washed away			

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-03 SHEET 3 OF 3

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design | LOCATION : (463237.4 N, 1281390.8 E)

ELEVATION : 213.3 ft | DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING EQUIPMENT AND METHOD : Truck Mounted, CME 55, NQ size double tube core barrel | ORIENTATION : Vertical

WATER LEVELS : --- | START : 3/14/07 10:45 | END : 3/14/2007 | LOGGER : L. Seraydarian

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R.Q.D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
45 168.3	45.5						
	R8NQ 5 ft 73%	13	4 10+ 5 5	Fractures, 45 to 85 deg. , steeply dipping, pitted in same areas		gray, (2.5 Y 5/1), soft, medium sand to coarse sand, extremely weathered gneiss, medium rough, close fracture spacing	Rock coring rates (min/ft): 2,2,2,2.15
50 163.3	50.5						
	R9NQ 5 ft 88%	38	7 2 2 1 3	Fractures, rust brown in fracture, 10 to 90 deg. , very steeply dipping, moderately close, no infilling		**Gneiss*** light gray, (Gley 1 7/N), hard, medium sand to coarse sand, possible top of bedrock is at 52.8 ft bgs	Rock coring rates (min/ft): 3.08, 3.17, 3.22, 3.25, 3.58
55 158.3	55.5						
						Bottom of Boring at 55.5 ft below ground surface on 3/14/2007	
60 153.3							
65 148.3							
70 143.3							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-04 SHEET 1 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463056.7 N, 1281457.2 E)

ELEVATION : 220.5 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 32.0 ft below ground surface START : 2/27/07 10:40 END : 2/28/07 12:45 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
220.5	0.0 1.0	10.0	S1SS	1-2	**Clayey Silt* (ML)** brown, moist, soft, low plasticity, trace organics, trace mical (fill)		PP=0.5 tsf
	2.0	9.0	S2SS	3-2			
	3.0	5.0	S3SS	3-4			PP=1.0 tsf
	4.0	11.0	S4SS	3-4			
5	5.0	8.0	S5SS	5-4			PP=0.5 tsf
215.5	6.0	9.0	S6SS	2-25			PP=1.25 tsf
	7.0	9.0	S7SS	12-17	**Sandy Silt* (ML)** grayish brown, moist, low to non plasticity, mottled red, trace rock fragments (fill)		PP=2.25 tsf
	8.0	10.0	S8SS	12-14	concrete and brick at 6.5' some clay, slag/black material at 12.8', wet at 8 ft , few rock fragments brick, slag, quartize cobbles		
	9.0	12.0	S9SS	6-10			spoon wet; possibly perchered water PP=1.25 tsf
10		10.0	S10SS	10-7-13 (20)	gray brown, wet, very stiff, fine to medium grained, low to non plasticity, few rock fragments, brick at 10'		
210.5	10.5						Note: Split spoon was sampled every 1 ft for top 10 ft due to Unexploded Ordnance (UXO) check. UXO check was performed every 1 ft from 0 to 10 ft and at 13.5, 18.5, and 23.5 ft. No UXO interference was detected. No elevated Photo Ionisation Detector (PID) readings.
	13.5						
	15.0	15.0	S11SS	22-20-34 (54)	tan brown, moist, hard, very fine to medium grained, nonplastic, non-cohesive, trace rock fragments		
15							
205.5	18.5						
	20.0	10.0	S12SS	20-22-35 (57)	**Sand And Gravel (GP)** gray brown, wet, very dense, fine to coarse grained, nonplastic, concrete (fill)		grinding sound; Gravel = 40.6%, sand = 46.2%, and fines = 13.2%
20							
200.5	23.5						
	24.0	6.0	S13SS	50/6	concrete		grinding sound; Replace 2.25" augers w/3.25" augers
25							
195.5	28.5						Auger won't go through at 23.5'. It went through after auger head was changed.
	30.0	12.0	S14SS	11-9-7 (16)	**Clayey Silt* (ML)** orange brown, moist, very stiff, low to medium plasticity, few fine sands, trace rock fragments		PP=1.25 tsf; LL=25, PL=15, PI=10
30							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-04 SHEET 2 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463056.7 N, 1281457.2 E)

ELEVATION : 220.5 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 32.0 ft below ground surface START : 2/27/07 10:40 END : 2/28/07 12:45 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
190.5							
	33.5						
	35.0	18.0	S15SS	4-4-6 (10)	**Sandy Silt (ML)** gray, moist, stiff to very stiff, low to medium plasticity, little sand, few clay, trace rock fragments		PP=2.25 tsf; sand = 28.4%, silt = 63%, and clay = 8.6%
35 185.5	37.0		ST1				
	38.5						
	40.0	16.0	S16SS	6-8-8 (16)			
40 180.5	43.5						
	45.0	13.0	S17SS	14-17-17 (34)	**Silty Sand* (SM)** orange brown, wet, dense to very dense, fine to medium grained, nonplastic, trace rock fragments, trace mica		PP=0.75 tsf
45 175.5	48.5						
	50.0	16.0	S18SS	5-28-50/6 (78/12")	very dense		PP=4.5 tsf
50 170.5	53.5						
	54.4	11.0	S19SS	26-50/5 (50/5")	tan brown		PP=2.75 tsf grinding
55 165.5	58.5						
	59.5	12.0	S20SS	12-50/6			PP=2.0 tsf
60							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-04 SHEET 3 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463056.7 N, 1281457.2 E)

ELEVATION : 220.5 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 32.0 ft below ground surface START : 2/27/07 10:40 END : 2/28/07 12:45 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
160.5					**Silty Sand* (SM)** orange brown, wet, very dense, fine to medium grained, nonplastic, trace rock fragments, trace mica		
63.5							
63.6	1.0	S21SS		50/1 (50/1")			
65							
155.5	65.4						Auger refusal at 65.4 ft bgs
					Begin Rock Coring at 65.4 ft below ground surface See the next sheet for the rock core log		
70							
150.5							
75							
145.5							
80							
140.5							
85							
135.5							
90							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
339179.RD.FI	BH-04	SHEET 4 OF 4

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design — LOCATION : (463056.7 N, 1281457.2 E)

ELEVATION : 220.5 ft — DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING EQUIPMENT AND METHOD : ATV, CME 55, NQ size double tube core barrel — ORIENTATION : Vertical

WATER LEVELS : 32.0 ft below ground surface — START : 2/27/07 10:40 — END : 2/28/07 12:45 — LOGGER : R. Calimer

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R.Q.D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	65.4		6	medium rough, dark brown to black staining, gently to moderate dipping, narrow to very wide separation.		**Gneiss*** light bluish gray, (Gley 2 7/1 10B), fine to coarse grained, soft to hard, moderately weathered to highly weathered, close spacing	3 Min 22 Sec / ft
			4				2'37" / ft, UCS = 12916 psi
	R1NQ 5.2 ft 99%	58	4				2 Min 38 Sec / ft
			2				2 Min 45 Sec / ft
70 150.5	70.6		4	black staining, near vertical fracture, very thinly filled with silt, wide separation			3 Min 5 Sec / ft
			5	gently to steeply dipping			2 Min 33 Sec / ft
			4				2 Min 39 Sec / ft
	R2NQ 5 ft 100%	22	6	reddish brown staining, near vertical fracture from 71.5'-74', very thinly filled with silt, narrow sepatration.			3 Min 4 Sec / ft
			2				3 Min 5 Sec / ft
75 145.5	75.6		1				2 Min 56 Sec / ft
			1			medium soft to hard, close to moderate close spacing	2 Min 26 Sec / ft
			5				2 Min 42 Sec / ft
	R3NQ 5 ft 100%	35	4	78'1" to 78'6" - black and tan brown staining, near vertical fracture, very thinlyfilled with silt , wide separation			3 Min 6 Sec / ft
			3				2 Min 17 Sec / ft
80 140.5	80.6		2				2 Min 33 Sec / ft
85 135.5						Bottom of Boring at 80.6 ft below ground surface on 2/28/07 12:45	1. Core barrel was not able to be pulled out and abandoned in the hole. The hole was grouted. 2. Cave-in at 35'7". No water readings.
90 130.5							
95 125.5							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-05 SHEET 1 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463102.6 N, 1281463.0 E)

ELEVATION : 219.4 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 3-1/4" ID HSA, 140 lb hammer with cathead, 2 OD Split Spoon

WATER LEVELS : 31.0 ft below ground surface START : 3/1/07 11:05 END : 3/6/07 14:00 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
219.4	0.0 1.0	9.0	S1SS	1-2	**Silt * (ML)** brown, moist, low plasticity, trace rock fragments, trace organics (fill)		PP=1.0 tsf (breaks)
	2.0	8.0	S2SS	2-3			
	3.0	7.0	S3SS	4-3	coarse quartzite and limestone grained from 3-4' trace sand & rock fragments (fill)		
	4.0	6.0	S4SS	4-3			
5	5.0	9.0	S5SS	2-2	**Clayey Silt * (ML)** gray brown, moist, low to medium plasticity		PP=0.75 tsf
214.4	6.0	10.0	S6SS	2-5			PP=4.5 tsf
	7.0	12.0	S7SS	6-14	**Sandy Clay * (ML)** tan brown, moist, fine to medium grained, low plasticity, trace rock fragments, glass & quartzoe gravel, red brick at 7ft. (fill)		Chloride=15 ppm, pH= 6.8, Resistivity=4590 ohm-cm, Sulfate=96 ppm
	8.0	12.0	S8SS	21-24			PP=3.5
	9.0	3.0	S9SS	8-7	**Sandy Silt * (ML)** brown, moist, fine to medium grained, low to non plasticity, some rock fragments, trace brick and glass, concrete (fill)		PP=2.0 Chloride=9 ppm, pH=7.06, Resistivity=3090 ohm-cm, Sulfate=107 ppm.
	9.3	3.0	S10SS	50/3 (50/3")			PP=1.75, Grinding from 7' to 10'
10 209.4							Note: Split spoon was sampled every 1 ft for top 10 ft due to Unexploded Ordnance (UXO) check. UXO check was performed every 1 ft from 0 to 10 ft and at 13.5, 18.5, and 23.5 ft. No UXO interference was detected. No elevated Photo Ionisation Detector (PID) readings.
	13.5						
	15.0	18.0	S11SS	6-25-30 (55)	**Sand, Silt , Clay & Gravel * (ML)** various colors, moist, black slag material (fill)		
15 204.4							
	18.5						Auger refusal @ 16', 12' and 17.5' bgs. Possible boulder underground. Boring locations offset 3 times within 3' from origional location to avoid boulders.
	20.0	4.0	S12SS	22-21-17 (38)	gray rock fragments		
20 199.4							
	23.5						
	25.0	11.0	S13SS	8-11-10 (21)	**Sandy Silt * (ML)** gray brown, moist, very stiff, nonplastic, few rock fragment (fill)		PP=2.0 tsf
25 194.4							
	28.5						
	30.0	18.0	S14SS	3-3-7 (10)	**Silty Clay * (CL)** tan brown, moist to wet, stiff, medium to high plasticity, trace rock fragment (fill)		PP=1.5 tsf, LL=31, PL=16, PI=15
30							

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-05 SHEET 2 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463102.6 N, 1281463.0 E)

ELEVATION : 219.4 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 3-1/4" ID HSA, 140 lb hammer with cathead, 2 OD Split Spoon

WATER LEVELS : 31.0 ft below ground surface START : 3/1/07 11:05 END : 3/6/07 14:00 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
189.4					**Silty Clay * (CL)** tan brown & gray brown, medium stiff to stiff		
	33.5						
		14.0	S15SS	4-4-4 (8)			PP=2.75 tsf
35	35.0						
184.4							
	38.5						
		18.0	S16SS	3-5-7 (12)	**Silty Sand (SM)** Tan brown, wet, medium dense, very fine to medium grained, nonplastic, trace rock fragments, and mica		(native)
40	40.0						
179.4							
	43.5						
		18.0	S17SS	5-6-10 (16)			PP=2.0 tsf (non cohesive) gravel=1%, sand=70.6%, fines=28.3%
45	45.0						
174.4							
	48.5 48.7						
		3.0	S18SS	50/3 (50/3")	**Silty Sand * (SM)** Tan brown, wet, very dense, fine to coarse grained, rock fragments,partialy weathered rock		
50							
169.4							
	53.5 53.7						
		5.0	S19SS	50/5 (50/5")			
55							
164.4							
	58.5 58.7						
		3.0	S20SS	50/3 (50/3")			
60							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-05 SHEET 3 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463102.6 N, 1281463.0 E)

ELEVATION : 219.4 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 3-1/4" ID HSA, 140 lb hammer with cathead, 2 OD Split Spoon

WATER LEVELS : 31.0 ft below ground surface START : 3/1/07 11:05 END : 3/6/07 14:00 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
159.4					**Silty Sand * (SM)** Tan brown, wet, very dense, fine to coarse grained, rock fragments,partialy weathered rock		
	63.5 63.6	1.0	S21SS	50/1 (50/1")			
65 154.4							
	68.5	0.0	S22SS	50/0			
70 149.4	71.0						Auger Refusal at 71 ft bgs
					Begin Rock Coring at 71.0 ft below ground surface See the next sheet for the rock core log		
75 144.4							
80 139.4							
85 134.4							
90							

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-05 SHEET 4 OF 4

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design — LOCATION : (463102.6 N, 1281463.0 E)

ELEVATION : 219.4 ft — DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING EQUIPMENT AND METHOD : ATV, CME 55, NQ size double tube core barrel — ORIENTATION : Vertical

WATER LEVELS : 31.0 ft below ground surface — START : 3/1/07 11:05 — END : 3/6/07 14:00 — LOGGER : R. Calimer

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
71.0			4	medium rough, dark brown staining, gently to medium dipping, thin silt and sand infilling, narrow to wide separation		**Gneiss*** light greenish gray, (Gley 1 7/1 10Y), fine to coarse grained, very soft to med soft, slightly weathered to highly weathered, close spacing	greenish gray return water, 2 min 17 sec/ft, UCS = 7962 psi
	R1NQ 5 ft 100%	55	5				2 min 28 sec /ft
			4				2 min 39 sec /ft
			3				3 min 31 sec /ft
75 144.4			2				2 min 5 sec /ft, UCS = 6161 psi
76.0			4	medium rough, dark brown and yellow orange, narrow, steeply dipping joint		medium soft to hard, slightly weathered to moderately weathered	2 min 48 sec /ft
	R2NQ 5 ft 100%	57	3				2 min 11 sec /ft
			5				2 min 34 sec /ft
80 139.4			2				2 min 19 sec /ft
81.0			3				3 min 58 sec /ft
			5	medium rough		soft to medium soft, very close, close spacing	2 min 24 sec /ft
	R3NQ 5 ft 100%	42	5				1 min 57sec /ft
			3				2 min 29 sec /ft
85 134.4			4				2 min 43 sec /ft
86.0			4				2 min 56 sec /ft
90 129.4						Bottom of Boring at 86.0 ft below ground surface on 3/6/07 14:00	Note: 1. 86 ft long PVC pipe in 1" diameter was installed in BH-05 as temporary well. Bottom 10 ft was slotted. 2.. Water was 34' 11" bgs at 15:00PM on 3/8/07 3. Water at 31', 3/20/07 07:40
95 124.4							
100 119.4							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-06 SHEET 1 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463151.4 N, 1281466.6 E)

ELEVATION : 218.5 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 3-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 32.5 ft below ground surface START : 3/5/07 11:40 END : 3/8/07 15:30 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
218.5	0.0 1.0	9.0	S1SS	2-2	**Silt * (ML)** brown, moist, medium stiff, low to non plasticity, trace organics, trace sand, rock fragments (fill)		PP=1.0 tsf
	2.0	8.0	S2SS	3-3			
	3.0	6.0	S3SS	4-4	**Clay Silt * (ML)** brown, moist, medium stiff, low to non plasticity, (fill)		
	4.0	6.0	S4SS	4-4			
5	5.0	8.0	S5SS	3-3	gray and brown		PP=0.75 tsf (breaks)
213.5	6.0	12.0	S6SS	2-4			
	7.0	12.0	S7SS	9-9	**Sandy Silt * (ML)** gray brown, moist, stiff, nonplastic, trace rock fragments (fill)		PP=3.5 tsf (breaks)
	8.0	9.0	S8SS	9-7			
	9.0	4.0	S9SS	4-7	tan brown, some clay, little rock fragments, quartize gravel, brick fragments		PP=1.0 tsf (breaks)
10	10.5	11.0	S10SS	3-7-11 (18)	gray brown, very stiff		
208.5	13.5						Note: Split spoon was sampled every 1 ft for top 10 ft due to Unexploded Ordnance (UXO) check. UXO check was performed every 1 ft from 0 to 10 ft and at 13.5, 18.5, and 23.5 ft. No UXO interference was detected. No elevated Photo Ionisation Detector (PID) readings.
15	15.0	14.0	S11SS	4-3-12 (15)	asphalt at 14.5'		
203.5	18.5						
20	20.0	14.0	S12SS	3-5-6 (11)	tan brown, stiff, few rock fragments		PP=0.5 tsf
198.5	23.5						
25	25.0	12.0	S13SS	17-9-10 (19)	**Clayey Silt * (ML)** tan brown, moist, very stiff, trace sand and rock fragments, black slag at 23.5', wood at 25' (fill)		
193.5	28.5						
30		16.0	S14SS	3-5-5 (10)	**Silty Clay * (CL)** brown, moist, stiff, medium to high plasticity, trace rock fragments, possible fill		PP=2.75 tsf, LL=29, PL=16, PI=13

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-06 SHEET 2 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463151.4 N, 1281466.6 E)

ELEVATION : 218.5 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 3-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 32.5 ft below ground surface START : 3/5/07 11:40 END : 3/8/07 15:30 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
188.5	30.0		ST1		**Fat Clay* (CH)** brown, moist, stiff, medium to high plasticity		PP=0.25 tsf, collect shelby tube
	32.0						
	33.5						
	35.0	16.0	S15SS	5-4-17 (21)	**Sandy Silt* (ML)** tan brown, wet, very stiff, nonplastic, trace rock fragments, partially weathered rock		PP=0.5 tsf
35 183.5							
	38.5						
	39.3	9.0	S16SS	46-50/3 (50/3")			PP=1.5 tsf
40 178.5							
	43.5						
	44.4	11.0	S17SS	35-50/5 (50/5")			PP=1.25 tsf
45 173.5							
	48.5						
	49.6	14.0	S18SS	25-40-50/2 (90/8")	**Silty Sand * (SM)** tan brown, wet, very dense, nonplastic, trace rock fragments, partially weathered rock		
50 168.5							
	53.5						
	53.8	3.0	S19SS	50/3 (50/3")	**Sandy Silt* (ML)** tan brown, wet, very stiff, nonplastic, trace rock fragments, partially weathered rock		
55 163.5							
	58.5						
	58.8	3.0	S20SS	50/3 (50/3")			
60							

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-06 SHEET 3 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463151.4 N, 1281466.6 E)

ELEVATION : 218.5 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 3-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 32.5 ft below ground surface START : 3/5/07 11:40 END : 3/8/07 15:30 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
158.5					**Sandy Silt* (ML)** tan brown, wet, very stiff, nonplastic, trace rock fragments, partially weathered rock		
63.5							
63.9	5.0	5.0	S21SS	50/5 (50/5")	few rock fragments		
65							
153.5							
66.8							Auger refusal at 66.8 ft
					Begin Rock Coring at 66.8 ft below ground surface See the next sheet for the rock core log		
70							
148.5							
75							
143.5							
80							
138.5							
85							
133.5							
90							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
339179.RD.FI	BH-06	SHEET 4 OF 4

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design — LOCATION : (463151.4 N, 1281466.6 E)

ELEVATION : 218.5 ft — DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING EQUIPMENT AND METHOD : ATV, CME 55, NQ size double tube core barrel — ORIENTATION : Vertical

WATER LEVELS : 32.5 ft below ground surface — START : 3/5/07 11:40 — END : 3/8/07 15:30 — LOGGER : R. Calimer

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R.Q.D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	66.8		4	medium rough, dark brown to orange brown staining, gently to moderately dipping, very narrow to wide separation, very thin sand and silt infilling		**Gneiss*** fine to coarse grained, med soft to hard, slightly weathered to moderately weathered, gray (Gley1 6/1 10Y) when it was wet, llight bluish gray (Gley 2 8/1 5B) when it was day, close spacing	light gray water return, 2 min 34 sec /ft
	R1NQ 4.2 ft 92%	48	3				2 min 28 sec /ft, UCS = 7136 psi
			4				2 min 54 sec /ft
70 148.5			3	medium rough, dark brown orange & orange brown staining, steeply dipping fracture and thinly filled with silt, wide separation			4 min 12 sec /ft
	71.0		3	near vertical fracture, orange brown staining, very thinly filled with silt		hard, fresh to slightly weathered, moderately close to wide spacing	3 min 19 sec /ft
			1				3 min 53 sec /ft
	R2NQ 5 ft 103%	92	1				3 min 20 sec /ft
			1				3 min 42 sec /ft
75 143.5			1				3 min 34 sec /ft
	76.0		0				3 min 12 sec /ft, blueish gray water return
			1	a few mechanical joint			3 min 12 sec /ft
	R3NQ 5 ft 97%	97	0				3 min 56 sec /ft
			2				3 min 42 sec /ft
80 138.5			0				3 min 51 sec /ft
	81.0		1	medium rough, some dark brown and orange brown staining, sand and silt infilling, moderately dipping, narrow separation		slightly weathered to moderately weathered, close to moderately close spacing	
			0				3 min 16 sec /ft
	R4NQ 5 ft 105%	105	2				4 min 4 sec /ft
			0				4 min 42 sec /ft
85 133.5			2				4 min 22 sec /ft
	86.0						3 min 4 sec /ft
						Bottom of Boring at 86.0 ft below ground surface on 3/8/07 15:30	Note: 1. Water was 32'6" bgs at 17:50 on 3/8/2007. Cave in at 33' bgs
90 128.5							2. Water was 33' bgs at 14:28 on 3/9/2007. Cave in at 36' bgs
95 123.5							

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-07 SHEET 1 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463051.9 N, 1281517.3 E)

ELEVATION : 222.1 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 35.4 ft below ground surface START : 2/26/07 00:08 END : 2/26/07 17:15 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
222.1	0.0 1.0	12.0	S1SS	2-2	**Silt * (ML)** brow, moist, soft to medium stiff, low plasticity, trace fine sand, trace organics (fill)		PP=1.0 tsf
	2.0	8.0	S2SS	3-3			
	3.0	7.0	S3SS	2-2	trace rock fragments		PP=0.25 tsf
	4.0	10.0	S4SS	3-4			
5	5.0	10.0	S5SS	6-6	gray brown, little clay, no organics		PP=0.75 tsf
217.1	6.0	12.0	S6SS	2-8			
	7.0	12.0	S7SS	8-15	**Sandy Silt * (ML)** tan brown, moist, very stiff, low to non plasticity, fine to medium sand , few rock fragments, gray concrete at 6.5' and 7.5', trace brick fragments (fill) 3"		PP=1.25 tsf
	8.0	10.0	S8SS	10-16			
	9.0	6.0	S9SS	8-9	**Silty Sand * (SM)** blackish gray, moist to dry, medium dense, rock fragmets brick, non cohesive (fill)		PP=2.25 tsf
10		16.0	S10SS	4-20-18 (38)			PP=1.5 tsf
212.1	10.5				**Sandy Silt* (ML)** gray brown, moist, medium stiff to hard, low to non plasticity, brick and concrete at 9.5' (fill)		PP=1.0 tsf Note: Split spoon was sampled every 1 ft for top 10 ft due to Unexploded Ordnance (UXO) check. UXO check was performed every 1 ft from 0 to 10 ft and at 13.5, 18.5, and 23.5 ft. No UXO interference was detected. No elevated Photo Ionisation Detector (PID) readings.
	13.4 13.5						
		1.0	S11SS	50/1 (50/1")			PP=0.75 tsf grinding from 10-13' Possible boulders
15 207.1	18.5						
	20.0	15.0	S12SS	14-11-3 (14)	**Silty Sand* (SM)** tan brown, moist, medium dense, nonplastic, very fine to fine sand , trace micas, few rock fragments (fill)		PP=0.25 tsf gravel=3.1%, sand=79.5%, fines=17.4%
20 202.1	23.5						
	25.0	16.0	S13SS	4-6-9 (15)	**Silt Clay * (CL)** brown, moist to wet, stiff to very stiff, medium to high plasticity, trace fine sands (fill)		Replace with 3-1/4" augers, wet spoon PP=3.25 tsf
25 197.1	28.5				**Sandy Silt * (ML)** orange brown, moist to wet, stiff, nonplastic, few rock fragments (fill)		
	30.0	16.0	S14SS	4-4-6 (10)	**Silty Clay * (CL)** yellowish pink, moist to wet, stiff, medium to high plasticity, trace fine sand and rock fragments (fill)		PP=0.75 tsf LL=27 , PL=15 ,PI=12
30							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-07 SHEET 2 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463051.9 N, 1281517.3 E)

ELEVATION : 222.1 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 35.4 ft below ground surface START : 2/26/07 00:08 END : 2/26/07 17:15 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
192.1							
	33.5						
		18.0	S15SS	3-6-5 (11)	**Clayey Silt (ML)** gray, moist, stiff, little sand, trace rock fragments, large (>6") wood fragment, with black staining on soil (fill)		PP=0.5 tsf sand=17.9% silt=66.8% clay=15.3%
35	35.0						
187.1							
	38.5						
	38.8	4.0	S16SS	50/4 (50/4")	**Silty Sand (SM)** tan brown, wet, very dense, fine to medium grained, trace rock fragment		PP=2.25 tsf
40							
182.1							
	43.5						
		15.0	S17SS	13-28-36 (64)	very fine grained, few micas		PP=1.0 tsf sand=71.8% fines=78.2%
45	45.0						
177.1							
	48.5						
	48.8	10.0	S18SS	43-50/4 (50/4")			PP=2.0 tsf
50							
172.1							
	53.5						
	53.8	3.0	S19SS	50/3 (50/3")			PP=0.25 tsf
55							
167.1							
	58.5						
	58.8		S20SS	50/4 (50/4")			PP=1.25 tsf Auger Refusal at 62.9' bgs on 2/26/07 14:00
60							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-07 SHEET 3 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463051.9 N, 1281517.3 E)

ELEVATION : 222.1 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 35.4 ft below ground surface START : 2/26/07 00:08 END : 2/26/07 17:15 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
162.1							
62.9					Begin Rock Coring at 62.9 ft below ground surface See the next sheet for the rock core log		
65 157.1							
70 152.1							
75 147.1							
80 142.1							
85 137.1							
90							

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-07 SHEET 4 OF 4

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design — LOCATION : (463051.9 N, 1281517.3 E)

ELEVATION : 222.1 ft — DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING EQUIPMENT AND METHOD : ATV, CME 55, NQ size double tube core barrel — ORIENTATION : Vertical

WATER LEVELS : 35.4 ft below ground surface — START : 2/26/07 00:08 — END : 2/26/07 17:15 — LOGGER : R. Calimer

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	62.9						
	R1NQ 2.3 ft 99%	60	3	medium rough, dark yellowish brown staining, modrately dipping, narrow to wide separation,		**Gneiss*** fine to coarse grained, soft to hard, moderately weathered to slightly weathered, greenish gray (Gley1 5/1 5GY) when it was wet, light bluish gray (Gley1 7/1 10B) when it was dry highly weathered from 65'-65.17'	2 Min 37 Sec /ft
			3	medium rough, undulating, 64.2' to 64.7' - vertical fracture			2 Min 36 Sec /ft
65 157.1	65.3						
			4	brown orange & black staining			1 Min 52 Sec /ft
			1				2 Min 16 Sec /ft
	R2NQ 5 ft 100%	83	2				2 Min 25 Sec /ft
			2	slightly rough, fracture filled with silt and sand , wide to very wide separation.		3" completely weathered fracture at 67'10", decomposed to rock and sand	2 Min 33 Sec /ft
70 152.1	70.3		2				2 Min 24 Sec /ft
			3	medium rough, brown, 70.3' to 70.6' - nearly vertical fracture, narrow		close to moderate close spacing	
			2	gently to moderate dipping			2 Min 56 Sec /ft, UCS = 6779 psi
	R3NQ 5 ft 95%	65	3				3 Min 12 Sec /ft
			2				2 Min 25 Sec /ft
75 147.1	75.3		2	possible mechanical break at 74'.4"			3 Min 22 Sec /ft
			1				2 Min 15 Sec /ft
	R4NQ 2.7 ft 94%	50	7	76.9' to 77.9' - vertical and horizontal fractures, very thin infilling to no infilling, orange brown and black staining			2 Min 55 Sec /ft
	77.9					Bottom of Boring at 77.9 ft below ground surface on 2/26/07 17:15	Note: 1. Water at 35.5', cave in at 58' bgs on 2/27/2006 10:00. 2. Water at 35.4', cave in at 56' bgs.
80 142.1							
85 137.1							
90 132.1							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-08 SHEET 1 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463104.3 N, 1281523.3 E)

ELEVATION : 221.2 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 3-1/4" ID HSA, 140 lb hammer with cathead, 2 OD Split Spoon

WATER LEVELS : 35.3 ft below ground surface START : 2/22/07 09:30 END : 2/23/07 11:30 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
221.2	0.0						
	1.0	10.0	S1SS	1-2	**Silt* (ML)** brown, moist, medium stiff, low plasticity, trace rock fragments, trace orgnic (fill)		PP=1.25 tsf
	2.0	10.0	S2SS	3-3			
	3.0	5.0	S3SS	3-3	low to medium plasticity, wood chip		PP=0.75 tsf
	4.0	3.0	S4SS	3-2			
5	5.0	9.0	S5SS	4-4			PP=0.5-1.5 tsf
216.2	6.0	10.0	S6SS	3-5			
	7.0	7.0	S7SS	5-8			PP=4.5 tsf Grinding from 6.5' to 12' possible boulders
	8.0	11.0	S8SS	8-50/5 (50/5")	**Sandy Silt* (ML)** brown, moist, very dense, low to non plasticity, fine to medium grained sand, few rock fragments, trace brick fragments, gray rock pieces, concrete pieces (fill)		
	9.0	2.0	S9SS	50/2 (50/2")	very dense		
10	10.5	4.0	S10SS	50/4 (50/4")			
211.2	13.5						
	15.0	7.0	S11SS	13-50/6	**Silty Sand * (SM)** dark gray, moist, very dense, nonplastic, fine to medium grained sand, trace micas, some rock fragments, quartz rock at the end of spoon (fill)		gravel=9.2%, sand=49.8%, fines=41% Note: Split spoon was sampled every 1 ft for top 10 ft due to Unexploded Ordnance (UXO) check. UXO check was performed every 1 ft from 0 to 10 ft and at 13.5, 18.5, and 23.5 ft. No UXO interference was detected. No elevated Photo Ionisation Detector (PID) readings.
15							
206.2	18.5						
	20.0	16.0	S12SS	5-8-14 (22)	**Sandy Silt* (ML)** gray brown, moist, very stiff, fine to medium grained, low to non plasticity, few rock fragments, trace micas, (possible fill)		PP=1.5 tsf
20							
201.2	23.5						
	25.0	14.0	S13SS	7-5-5 (10)	**Silty Sand* (SM)** greenish gray, moist, loose to medium dense, very fine to medium grained, trace rock fragments, trace mica		sand=71.2% fines=28.8%
25							
196.2	28.5						
	30.0	16.0	S14SS	9-14-16 (30)	brown, dense		
30							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-08 SHEET 2 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463104.3 N, 1281523.3 E)

ELEVATION : 221.2 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 3-1/4" ID HSA, 140 lb hammer with cathead, 2 OD Split Spoon

WATER LEVELS : 35.3 ft below ground surface START : 2/22/07 09:30 END : 2/23/07 11:30 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
191.2					**Silty Sand* (SM)** brown, moist, dense to very dense		
	33.5						
		15.0	S15SS	12-16-19 (35)			Chloride=12 ppm, pH=4.9, Resistivity=437 ohm-cm, Sulfate=63 ppm.
35	35.0						
186.2							
	38.5						
			S16SS	14-33-41 (74)	tan brown, very dense, very fine to fine grained		
40	40.0						
181.2							
	43.5						
	44.2	9.0	S17SS	32-50/3 (50/3")	wet, fine to medium grained, trace micas, partially weathered rock		wet spoon
45							
176.2							
	48.5						
	48.8	10.0	S18SS	36-50/4 (50/4")	very fine to medium grained		spoon dry
50							
171.2							
	53.5						
	53.8	3.0	S19SS	50/3 (50/3")	brown, fine to medium grained		Grinding below 55'
55							
166.2							
	58.5						
	58.8	4.0	S20SS	50/4 (50/4")			
60							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-08 SHEET 3 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design

LOCATION : (463104.3 N, 1281523.3 E)

ELEVATION : 221.2 ft

DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 3-1/4" ID HSA, 140 lb hammer with cathead, 2 OD Split Spoon

WATER LEVELS : 35.3 ft below ground surface

START : 2/22/07 09:30

END : 2/23/07 11:30

LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
161.2					**Silty Sand* (SM)** brown, wet, very dense, fine to medium grained, highly weathered rock fragments		
63.5 63.7	2.0		S21SS	50/2 (50/2")			
65 156.2							
68.5 68.6	3.0		S22SS	50/3 (50/3")	Begin Rock Coring at 68.6 ft below ground surface See the next sheet for the rock core log		Auger refusal at 68.6 ft
70 151.2							
75 146.2							
80 141.2							
85 136.2							
90							

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-08 SHEET 4 OF 4

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design — LOCATION : (463104.3 N, 1281523.3 E)

ELEVATION : 221.2 ft — DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING EQUIPMENT AND METHOD : ATV, CME 55, NQ size double tube core barrel — ORIENTATION : Vertical

WATER LEVELS : 35.3 ft below ground surface — START : 2/22/07 09:30 — END : 2/23/07 11:30 — LOGGER : R. Calimer

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R.Q.D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	68.6						light gray water return
	R1NQ 1.6 ft 99%	47	3	Fracture, medium rough, grayish brown staining, very thin to no infilling, moderately dipping		**Gneiss*** light gray, (10YR 7/2), fine to medium grained, slightly weathered, medium soft to hard, close spacing,	2 Min 22 Sec /ft
70	70.2		2				1 Min 30 Sec /ft
151.2			2				1 Min 39 Sec /ft
			4				1 Min 52 Sec /ft
	R2NQ 5 ft 100%	33	4	medium rough, reddish brown staining, gently to very stepely dipping		yellowish brown, (10YR 5/6), medium grained, very soft to soft, highly weathered, close spacing, crumble in hand from 72.25' to 73.25'	1 Min 54 Sec /ft
			5				2 Min 18 Sec /ft
75			3				1 Min 53 Sec /ft
146.2	75.2						2 Min /ft
			2				
			3			light bluish gray, (GLEY 2 7/1 10B), fresh to slightly weathered	1 Min 51 Sec /ft, UCS = 7575 psi
	R3NQ 5 ft 100%	77	1				2 Min 20 Sec /ft
			2				2 Min 6 Sec /ft
			1				2 Min 58 Sec /ft
80	80.2						
141.2			2			very hard	2 Min 17 Sec /ft
	R4NQ 3.2 ft 99%	83	0				3 Min 14 Sec /ft
			4				5 Min 7 Sec /ft
	83.4						3 Min 10 Sec /ft
			6				1 Min 52 Sec /ft
85			2				2 Min 30 Sec /ft
136.2	R5NQ 5 ft 100%	75	0				2 Min 21 Sec /ft
			1				2 Min 48 Sec /ft
	88.4		2				
						Bottom of Boring at 88.4 ft below ground surface on 2/22/07 15:30	Note: 1. Water 35'4", cave in 56'4" on 2/23/2007 14:30
90							
131.2							
95							
126.2							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-09 SHEET 1 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463148.1 N, 1281528.4 E)

ELEVATION : 220.0 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 34.0 ft below ground surface START : 2/20/07 12:25 END : 2/21/07 14:00 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
220.0	0.0						
	1.0	5.0	S1SS	1-2	**Silt * (ML)** brown, moist, soft, low plasticity, trace sand, trace organics, trace mica (fill)		PP=0.75 tsf
	2.0	7.0	S2SS	1-2			
	3.0	10.0	S3SS	1-2	medium plasticity, some clay		PP=1.0 tsf PP=1.5 tsf
	4.0	12.0	S4SS	2-4			
5	5.0	12.0	S5SS	2-7	**Sand * (SP)** gray and brown, moist, medium dense, medium grained, some rock fragments (fill)		PP=1.75 tsf grinding
215.0	6.0	11.0	S6SS	11-9			
	7.0	12.0	S7SS	19-25	**Clayey Sand * (SC)** red brown, moist, very dense, low to medium plasticity, trace brick and glass, 1.5' chunck of cement. Blue gray rock, 6.5-8' (fill)		
	7.4	5.0	S8SS	50/5 (50/5")			PP=3.25 tsf
	8.0						
	9.0	10.0	S9SS	3-3	**Silty Sand (SM)** brown gray red, moist, loose to very dense, nonplastic, trace rock , brick, slag, asphalt-black staining (fill)		PP=2.0 tsf PP=0.75 tsf
10							
210.0	10.5	6.0	S10SS	9-9	hard		
	13.5						
	14.9	8.0	S11SS	7-12-50/5 (62/11")	blackish gray, very dense, trace concrete fragments , brick at 14.5'		PP=1.75 tsf gravel=29%, sand=40.8%, fines=30.2%
15							
205.0							Note: Split spoon was sampled every 1 ft for top 10 ft due to Unexploded Ordnance (UXO) check. UXO check was performed every 1 ft from 0 to 10 ft and at 13.5, 18.5, and 23.5 ft. No UXO interference was detected. No elevated Photo Ionisation Detector (PID) readings.
	18.5						
	20.0	11.0	S12SS	27-39-12 (51)	light gray, dry, very dense, nonplastic, weathered rock fragments		
20							
200.0							
	23.5						
	25.0	11.0	S13SS	4-6-9 (15)	**Sandy Silt * (ML)** tan brown, moist, stiff to very stiff, fine to medium grained, nonplastic, trace micas		switch to 3.25in Augers PP=2.0 tsf
25							
195.0							
	28.5						
	30.0	14.0	S14SS	12-16-22 (38)	**Silty Sand* (SM)** tan brown, moist, dense, trace rock fragments		PP=1.0 tsf (breaks, non-cohesive)
30							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-09 SHEET 2 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463148.1 N, 1281528.4 E)

ELEVATION : 220.0 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 34.0 ft below ground surface START : 2/20/07 12:25 END : 2/21/07 14:00 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
190.0					**Silty Sand* (SM)** tan brown, moist, dense, trace rock fragments		
	33.5						
	35.0	15.0	S15SS	12-17-25 (42)			
35							
185.0							
	38.5						
	39.8	16.0	S16SS	18-30-50/4 (80/10")	**Silty Sand* (SM)** tan brown, wet, very dense, very fine to fine grained, partially weathered rock		Wet spoon PP=1.75 tsf
40							
180.0							
	43.5						
	43.9	5.0	S17SS	50/5 (50/5")			PP=1.75 tsf
45							
175.0							
	48.5						
	48.8	4.0	S18SS	50/4 (50/4")			
50							
170.0							
	53.5						
	53.7	3.0	S19SS	50/3 (50/3")			Grinding from 55-60'
55							
165.0							
	58.5						
	58.7		S20SS	50/2 (50/2")	fine to medium grained, some gneiss rock fragments		
60							

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-09 SHEET 3 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463148.1 N, 1281528.4 E)

ELEVATION : 220.0 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 34.0 ft below ground surface START : 2/20/07 12:25 END : 2/21/07 14:00 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
160.0							Auger refusal at 61 ft
	61.0				Begin Rock Coring at 61.0 ft below ground surface See the next sheet for the rock core log		
65 155.0							
70 150.0							
75 145.0							
80 140.0							
85 135.0							
90							

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-09 SHEET 4 OF 4

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design
LOCATION : (463148.1 N, 1281528.4 E)

ELEVATION : 220.0 ft
DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING EQUIPMENT AND METHOD : ATV, CME 55, NQ size double tube core barrel
ORIENTATION : Vertical

WATER LEVELS : 34.0 ft below ground surface
START : 2/20/07 12:25
END : 2/21/07 14:00
LOGGER : R. Calimer

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	61.0		10+	Medium rough, flat to gently dipping, wide separation, clean to stained		**Gneiss *** dark yellowish brown, (10YR 4/4), very soft to soft, medium grained, highly weathered, close to very close spacing	2 Min 16 Sec /ft
			10+				1 Min 34 Sec /ft
	R1NQ 4.3 ft 54%	0					1 Min 47 Sec /ft
							1 Min 53 Sec /ft
65 155.0	65.3						
			10				1 Min 25 Sec /ft
			1				1 Min 28 Sec /ft, UCS = 10663 psi
	R2NQ 5 ft 105%	40	10+				1 Min 28 Sec /ft
			10	Medium rough, gently to medium dipping narrow to wide separation, clean to stained		light gray, (GLEY 7N), very hard to hard, fine to medium grained, slightly weathered, close spacing,	1 Min 32 Sec /ft
70 150.0	70.3		1				1 Min 13 Sec /ft
			3				
			1				
	R3NQ 5 ft 93%	68	2				
			1				2 Min 30 Sec /ft
			4				1 Min 25 Sec /ft
75 145.0	75.3						
	R4NQ 1 ft	92	2				
	76.3 \117%					Bottom of Boring at 76.3 ft below ground surface on 2/21/07 14:00	1. Water was at 35' bgs after augers pulled out, cave in at 59.8' bgs on 2/22/07 09:00 2. Water was at 34' bgs and cave in at 52' bgs on 2/23/07 10:00
80 140.0							
85 135.0							
90 130.0							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-10 SHEET 1 OF 3

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463042.8 N, 1281579.1 E)

ELEVATION : 223.8 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 34.3 ft below ground surface START : 2/8/07 08:30 END : 2/12/07 09:05 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
223.8	0.0 1.0	7.0	S1SS	2-2	**Silt * (ML)** Brown, moist, soft, nonplastic, trace organics , little clay (fill)		pp=2.75 tsf, frozen
	2.0	11.0	S2SS	2-2			PP=1.5 tsf
	3.0	12.0	S3SS	2-2	gray brown, low plasticity		PP=1.0 tsf
	4.0	9.0	S4SS	2-4	1" gravel at 4'		PP=0.25-1.75 tsf
5	5.0	7.0	S5SS	1-1	**Clayey Silt * (ML)** gray brown, moist, medium stiff, medium plasticity, trace sand, trace mica, quartzite gravels from 5.5-6' (fill)		PP=0.75 tsf
218.8	6.0	12.0	S6SS	3-8	gray brown, low plasticity, trace mica		PP=2.75 tsf
	7.0	12.0	S7SS	7-6	**Sandy Silt * (ML)** gray brown, moist, fine to medium grained sand grained, low to non plasticity, few quartzite rock fragments, trace mica, trace red brick(fill)		PP=0.5 tsf grinding 6'
	8.0	11.0	S8SS	5-4			PP=1.75 tsf
	9.0	11.0	S9SS	4-4			PP=0.5 tsf
10	10.5	14.0	S10SS	4-7-6 (13)			
213.8	13.5				Orange brown, stiff, very fine to fine grained, nonplastic		Note: Split spoon was sampled every 1 ft for top 10 ft due to Unexploded Ordnance (UXO) check. UXO check was performed every 1 ft from 0 to 10 ft and at 13.5, 18.5, and 23.5 ft. No UXO interference was detected. No elevated Photo Ionisation Detector (PID) readings.
15	15.0	5.0	S11SS	2-2-5 (7)	medium stiff, chunk of concrete , tile at 15 ft		
208.8	18.5						
20	20.0	18.0	S12SS	2-2-4 (6)	few clay		
203.8	23.5						
25	25.0	12.0	S13SS	9-14-11 (25)	**Silty Sand (SM)** Yellow brown to gray brown, moist, medium dense, fine to coarse grained, nonplastic, trace mica, trace gravel/cobbels, layer of black slags (fill)		gravel=4.5% sand=60.3% fines=35.1%
198.8	28.5						
30	30.0	14.0	S14SS	2-3-5 (8)	**Clayey Silt * (ML)** Gray brown, moist, medium stiff to stiff, low plasticity, trace rock fragments, few fine sands (possible fill)		PP=1.25-1.75 tsf LL=29 , PL=23 , PI=6

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-10 SHEET 2 OF 3

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463042.8 N, 1281579.1 E)

ELEVATION : 223.8 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 34.3 ft below ground surface START : 2/8/07 08:30 END : 2/12/07 09:05 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
193.8					**Clayey Silt * (ML)** Gray brown, moist, medium stiff to stiff, low plasticity, trace rock fragments, few fine sands (possible fill)		
	33.5						
35	35.0	9.0	S15SS	14-25-40 (65)	**Silty Sand * (SM)** Orange brown, moist, very dense, fine to medium grained, trace rock fragments, trace micas, partially weathered rock		
188.8							
	38.5						
40	40.0	12.0	S16SS	19-33-38 (71)	wet, few gneiss gravels		
183.8							
	43.5						
	44.5	12.0	S17SS	11-50/6	few micas		
45							
178.8							
	48.5						
	48.7	3.0	S18SS	50/3 (50/3")			PP=1.0 tsf (breaks)
50							
173.8							
	53.5						
	53.6		S19SS	50/1 (50/1")			
55							
168.8							
	58.0						
					Begin Rock Coring at 58.0 ft below ground surface See the next sheet for the rock core log		
60							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
339179.RD.FI	BH-10	SHEET 3 OF 3

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design — LOCATION : (463042.8 N, 1281579.1 E)

ELEVATION : 223.8 ft — DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING EQUIPMENT AND METHOD : ATV, CME 55, NQ size double tube core barrel — ORIENTATION : Vertical

WATER LEVELS : 34.3 ft below ground surface — START : 2/8/07 08:30 — END : 2/12/07 09:05 — LOGGER : R. Calimer

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	58.0						
	R1NQ 2.4 ft 101%	35	6	Fractures, horizontal and vertical, medium rough, red brown to orange brown staining in fractures		**Gneiss *** medium to coarse grained, slightly weathered, very pale brown (10YR 8/2) when it was wet, light gray (5 Y7/1) when it was dry, spickeled black, soft to medium soft.	2 Min 12 Sec /ft
			10+				2 Min 42 Sec /ft
60 163.8	60.4						
			3	Fractures, horizontal			2 Min 5 Sec /ft
			10+				3 Min 22 Sec /ft
	R2NQ 5 ft 90%	62	1				3 Min 5 Sec /ft
			2			very dark graish brown, (10YR 3/2), soft	3 Min 45 Sec /ft, UCS = 3520 psi
65 158.8	65.4		4				4 Min 38 Sec /ft
			4	Fractures, 60 deg and 75 deg			
			2				
	R3NQ 5 ft 90%	60	4				
			1				
70 153.8	70.4		4				
			1				
			1				4 Min 50 Sec /ft
	R4NQ 5 ft 105%	90	2				5 Min 16 Sec /ft
			2				4 Min 56 Sec /ft
75 148.8	75.4		3				5 Min 56 Sec /ft
			3				3 Min 46 Sec /ft
	R5NQ 2.6 ft 96%	42	3				3 Min 58 Sec /ft
	78.0						
				Fractures, 75 deg and 85 deg		Bottom of Boring at 78.0 ft below ground surface on 2/12/07 09:05	Note: 1.water at 34.3' 2/9/07 , 08:20 2. Cave in at 54'8 2/12/07 water at 54'7" bgs 14:00 3. Cave in at 60'4 2/13/07 water at 34'9, 07:50
80 143.8							
85 138.8							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-11 SHEET 1 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463095.8 N, 1281588.0 E)

ELEVATION : 223.3 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 35.3 ft below ground surface START : 2/12/07 14:39 END : 2/16/07 12:00 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
223.3	0.0						
	1.0	10.0	S1SS	3-3	**Silt * (ML)** brown, moist, medium stiff, low to non plasticity, trace organics (fill)		PP=0.75-1.0 tsf
	2.0	11.0	S2SS	2-3	soft, low plasticity, trace micas		PP=1.25-1.5 tsf
	3.0	4.0	S3SS	2-2	low to medium plasticity, red & gray staining at 4.5'		PP=0.25 tsf
	4.0	9.0	S4SS	2-2			
5	5.0	12.0	S5SS	2-2			
218.3	6.0	12.0	S6SS	2-3			PP=0.75 tsf
	7.0						
	8.0	12.0	S7SS	5-7	**Silty Sand * (SM)** tan brown, moist, medium dense, fine to medium grained, nonplastic, skipped 6-7' sample		PP=1.75 tsf
	9.0	7.0	S8SS	6-6	trace rock fragments, trace clays		
10		9.0	S9SS	4-6-7 (13)	red, trace rock fragments, trace clays (fill)		PP=2.0 tsf
213.3	10.5						grinding at 10'
	13.5						Note: Split spoon was sampled every 1 ft for top 10 ft due to Unexploded Ordnance (UXO) check. UXO was performed every 1 ft from 0 to 10 ft and at 13.5, 18.5, and 23.5 ft. No UXO interference was detected. No elevated Photo Ionisation Detector (PID) readings.
15	15.0	12.0	S6SS	6-5-5 (10)	gray brown		
208.3	18.5						
20	20.0	12.0	S7SS	3-4-4 (8)	**Clayey Silt * (ML)** tan brown, moist, medium stiff, trace sand & rock fragments (fill)		PP=4.5 tsf LL=27, PL=18, PI=9
203.3	23.5						
	23.6	0.0	S8SS	50/1 (50/1")	no recovery		
25							
198.3	28.5						
30	30.0	9.0	S9SS	17-28-34 (62)	**Silty Sand * (SM)** light yellowish brown, dry, very dense, fine to medium grained, trace coarse sands, a lot of mica		

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-11 SHEET 2 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463095.8 N, 1281588.0 E)

ELEVATION : 223.3 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 35.3 ft below ground surface START : 2/12/07 14:39 END : 2/16/07 12:00 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
193.3					**Silty Sand * (SM)** light yellowish brown, dry, very dense, fine to medium grained, trace coarse sands, a lot of mica, partially weathered rock		
	33.5						
	34.6	14.0	S10SS	17-45-50/1 (95/7")			
35 188.3							
	38.5						
	39.0	6.0	S11SS	50/6	slightly moist		
40 183.3							
	43.5						
	43.8	4.0	S16SS	50/4 (50/4")	trace small gravel (1/4" diameter) , subrounded, saturated		
45 178.3							
	48.5						
	48.7	3.0	S17SS	50/3 (50/3")	dry, fine grained		
50 173.3							
	53.5						
	53.7	2.0	S18SS	50/2 (50/2")	moist, pieces of weathered bed rock (1" diameter)		
55 168.3							
	58.5						
	58.6	0.0	S19SS	50/1 (50/1")	No recovery		
60							

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-11 SHEET 3 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463095.8 N, 1281588.0 E)

ELEVATION : 223.3 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 35.3 ft below ground surface START : 2/12/07 14:39 END : 2/16/07 12:00 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
163.3					**Silty Sand * (SM)** light brown, chunks of weathered bed rock, saturated, mica rich, fine sand		
63.5							
63.8	1.0	S20SS		50/1 (50/1")			
65							
158.3							Auger refusal at 65.8 ft bgs
65.8					Begin Rock Coring at 65.8 ft below ground surface See the next sheet for the rock core log		
70							
153.3							
75							
148.3							
80							
143.3							
85							
138.3							
90							

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-11 SHEET 4 OF 4

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design — LOCATION : (463095.8 N, 1281588.0 E)

ELEVATION : 223.3 ft — DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING EQUIPMENT AND METHOD : ATV, CME 55, NQ size double tube core barrel — ORIENTATION : Vertical

WATER LEVELS : 35.3 ft below ground surface — START : 2/12/07 14:39 — END : 2/16/07 12:00 — LOGGER : R. Calimer

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	65.8		4	Fractures, 45 deg, rough, brown to reddish brown staining, medium rough		**Gneiss *** light gray, (5Y 7/2), medium grained, moderately weathered, speckled dark gray & black, soft to medium soft	4 Min 53 Sec /ft
			4				4 Min 47 Sec /ft
	R1NQ 5 ft 90%	30	5				4 Min 26 Sec /ft
			5				3 Min 11 Sec /ft
70 153.3			5				3 Min 39 Sec /ft
	70.8					light greenish gray, (Gley 1 7/1 10Y), hard, slightly weathered	
			3				
			4				3 Min 50 Sec /ft
	R2NQ 5 ft 103%	60	1				3 Min 35 Sec /ft
			3				3 Min 12 Sec /ft
75 148.3			0				3 Min 29 Sec /ft
	75.8						
			4				
			2				3 Min 55 Sec /ft, UCS = 7548 psi
	R3NQ 5 ft 103%	73	4				3 Min 32 Sec /ft
			3				3 Min 47 Sec /ft
80 143.3			2				3 Min 0 Sec /ft
	80.8					Bottom of Boring at 80.8 ft below ground surface on 2/16/07 12:00	Note: 1. 2/16/07 water at 34'6" after augers pulled out, cave in at 66'2" 2. 2/19/07 water at 35'4", cave in at 56'
85 138.3							
90 133.3							
95 128.3							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-12 SHEET 1 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463134.6 N, 1281588.0 E)

ELEVATION : 222.1 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 35.6 ft below ground surface START : 2/19/07 13:00 END : 2/20/07 08:20 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
222.1	0.0 1.0	7.0	S1SS	2-3	**Silt * (ML)** brown, moist, soft, low plasticity, trace sand, trace gravels, trace micas (fill)		PP=0 tsf
	2.0	9.0	S2SS	2-2			
	3.0	8.0	S3SS	1-2			PP=0.5 tsf
	4.0	10.0	S4SS	2-1	very stiff, trace brick fragments		
5	5.0	10.0	S5SS	1-2	**Clayey Silt * (ML)** gray brown, moist, soft, low to medium plasticity, trace fine sand, trace micas , Limestone rock at 6.5' (fill)		
217.1	6.0	12.0	S6SS	1-3			PP=0 tsf
	7.0	12.0	S7SS	5-7	**Sandy Silt * (ML)** tan brown, moist, stiff, nonplastic, trace rock fragments (fill) very stiff, trace brick fragments		PP=1.25-2.25 tsf
	8.0	9.0	S8SS	5-6			
	9.0	9.0	S9SS	8-8			
10	10.5	13.0	S10SS	4-7-8 (15)			PP=0.75-2.75 tsf, grinding
212.1							Note: Split spoon was sampled every 1 ft for top 10 ft due to Unexploded Ordnance (UXO) check. UXO was performed every 1 ft from 0 to 10 ft and at 13.5, 18.5, and 23.5 ft. No UXO interference was detected. No elevated Photo Ionisation Detector (PID) readings.
	13.5						
15	15.0	10.0	S11SS	3-5-5 (10)	brown, stiff, few rock fragments and wood fragments, trace micas		PP=1.0 tsf moisture content = 1.6% organic content =1.9%
207.1							
	18.5						
20	20.0	13.0	S12SS	6-7-7 (14)	**Silty Sand * (SM)** tan brown, moist, medium dense, fine to medium grained, nonplastic, few micas, trace rock fragments		Chloride=14 ppm, pH=8.09, Resistivity=9150 ohm-cm, Sulfate=58 ppm.
202.1							
	23.5						
25	25.0	14.0	S13SS	8-10-13 (23)	very fine sand & silt		Switch to 3.25"Augers
197.1							
	28.5						
30	30.0	18.0	S14SS	10-31-45 (76)	light brown, dry, very dense		

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-12 SHEET 2 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463134.6 N, 1281588.0 E)

ELEVATION : 222.1 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 35.6 ft below ground surface START : 2/19/07 13:00 END : 2/20/07 08:20 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
192.1					**Silty Sand * (SM)** tan brown, moist, medium dense, fine to medium grained, few micas, trace rock fragments		
	33.5						
		18.0	S15SS	8-10-17 (27)			
35	35.0						
187.1							
	38.5						
	38.8	10.0	S16SS	36-50/4 (50/4")	**Silty Sand * (SM)** tan brown, moist, very dense, fine to medium grained, partially weathered rock		
40							
182.1							
	43.5						
	43.8	4.0	S17SS	50/4 (50/4")	fine to medium grained		
45							
177.1							
	48.5						
	48.7	3.0	S18SS	50/3 (50/3")			
50							
172.1							
	53.5						
	53.7	3.0	S19SS	50/3 (50/3")			
55							
167.1							
	58.5						
	58.7	3.0	S20SS	50/2 (50/2")	wet, rock fragments		
60							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-12 SHEET 3 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463134.6 N, 1281588.0 E)

ELEVATION : 222.1 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 35.6 ft below ground surface START : 2/19/07 13:00 END : 2/20/07 08:20 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
162.1					**Silty Sand * (SM)** tan brown, wet, very dense, fine to medium grained, rock fragments, partially weathered rock		
63.5 63.6	63.5	1.0	S21SS	50/1 (50/1")			Auger refusal at 65 ft bgs.
65	65.0						
157.1					Begin Rock Coring at 65.0 ft below ground surface See the next sheet for the rock core log		
70 152.1							
75 147.1							
80 142.1							
85 137.1							
90							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
339179.RD.FI	BH-12	SHEET 4 OF 4

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design — LOCATION : (463134.6 N, 1281588.0 E)

ELEVATION : 222.1 ft — DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING EQUIPMENT AND METHOD : ATV, CME 55, NQ size double tube core barrel — ORIENTATION : Vertical

WATER LEVELS : 35.6 ft below ground surface — START : 2/19/07 13:00 — END : 2/20/07 08:20 — LOGGER : R. Calimer

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R.Q.D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
157.1	65.0		10+	Fractures, slightly to medium rough, steply dipping		**Gneiss *** greenish gray, (Gley 1 6/1 10Y), medium grained, highly weathered to moderately weathered, soft to medium soft, 65'-66'2" decomposed	5 Min. 17 Sec /ft
			10+				5 Min. 54 Sec /ft
	R1NQ 5 ft 100%	17	3				4 Min. 43 Sec /ft
			6				4 Min. 26 Sec /ft
			10+				2 Min. 57 Sec /ft
70	70.0						
152.1			10+	stains, moderately dipping, slightly rough		70-72' highly weathered	3 Min. 23 Sec /ft
			4				4 Min. 33 Sec /ft
	R2NQ 5 ft 83%	28	4			72-80' hard to very hard, slightly weathered	2 Min. 19 Sec /ft
			2				2 Min. 35 Sec /ft
							3 Min. 15 Sec /ft
75	75.0						
147.1			2	stains, Slightly to moderately dipping, slightly rough, narrow			3 Min. 55 Sec /ft
			1				2 Min. 54 Sec /ft
	R3NQ 5 ft 107%	75	6				2 Min. 41 Sec /ft
			2				2 Min. 42 Sec /ft
			3				3 Min. 15 Sec /ft
80	80.0						
142.1						Bottom of Boring at 80.0 ft below ground surface on 2/20/07 08:20	Note: 1. Water levels after auger pulled 2/20/07 11:00 34'6" bgs cave-in 48'6" 2. Water was 35'7" bgs on 2/21/07 07:30 cave-in 57'7"
85							
137.1							
90							
132.1							
95							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-13 SHEET 1 OF 3

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (462988.1 N, 1281644.4 E)

ELEVATION : 222.3 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 32.4 ft below ground surface START : 3/9/07 08:15 END : 3/12/07 12:00 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
222.3	0.0 1.0	12.0	S1SS	2-3	**Clayey Silt * (ML)** brown, moist, stiff, fine grained, low plasticity, trace rock fragments, trace organics (fill)		PP=1.25 tsf
	2.0	10.0	S2SS	8-7			
	3.0	11.0	S3SS	7-9			
	4.0	12.0	S4SS	5-23			
5	5.0	10.0	S5SS	9-11	**Silty Sand* (SM)** brown, moist, fine to medium grained, low to non plasticity, highly weathered, rock fragments at 5.5', trace rock fragments & mica. (fill)		
217.3	6.0	11.0	S6SS	10-8			
	7.0	7.0	S7SS	8-5			Moisture content=16% Organic content =1.9%
	8.0	3.0	S8SS	4-3			
	9.0	9.0	S9SS	3-3	1" quartiz rock at 9'		
10	10.5	8.0	S10SS	4-3-3 (6)	medium stiff		
212.3	13.5						Note: Split spoon was sampled every 1 ft for top 10 ft due to Unexploded Ordnance (UXO) check. UXO was performed every 1 ft from 0 to 10 ft and at 13.5, 18.5, and 23.5 ft. No UXO interference was detected. No elevated Photo Ionisation Detector (PID) readings.
15	15.0	18.0	S11SS	7-10-13 (23)	gray brown, few rock fragments orange brown , few clay		PP=3.0 tsf grinding
207.3	18.5						
20	20.0	3.0	S12SS	3-4-4 (8)			Auger refusal at 17'9" bgs, possibly boulder was encountered
202.3	23.5						Borehole was offset. The log is combination of the original and the offset borehole.
25	25.0	18.0	S13SS	3-8-20 (28)	**Sandy Silt * (ML)** brown, moist, very stiff, nonplastic		PP=1.75 Chloride=18 ppm, pH=6.02, Resistivity=8780 ohm-cm, Sulfate=51 ppm.
197.3	28.5						
30	30.0	18.0	S14SS	4-5-6 (11)	**Silty Sand * (SM)** orange brown, moist, medium dense, very fine to medium grained, trace rock fragments and mica		PP=0.25 tsf

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-13 SHEET 2 OF 3

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (462988.1 N, 1281644.4 E)

ELEVATION : 222.3 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 32.4 ft below ground surface START : 3/9/07 08:15 END : 3/12/07 12:00 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
192.3					**Silty Sand * (SM)** orange brown, moist, medium dense, very fine to medium grained, trace rock fragments, trace mica		
	33.5						
		12.0	S15SS	10-10-14 (24)	wet		
35	35.0						
187.3							
	38.5						
	39.0	6.0	S16SS	50/6	**Silty Sand* (SM)** orange brown, wet, very dense, very fine to medium grained, partially weathered		
40							
182.3							
	43.5						
	43.9	5.0	S17SS	50/5 (50/5")			
45							
177.3							
	48.5						
	48.7	3.0	S18SS	50/3 (50/3")			
50							
172.3							
	53.5						
	53.7	2.0	S19SS	50/2 (50/2")			
55							
167.3	55.8						Auger refusal at 55.8 ft
					Begin Rock Coring at 55.8 ft below ground surface See the next sheet for the rock core log		
60							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
339179.RD.FI	BH-13	SHEET 3 OF 3

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design — LOCATION : (462988.1 N, 1281644.4 E)

ELEVATION : 222.3 ft — DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING EQUIPMENT AND METHOD : ATV, CME 55, NQ size double tube core barrel — ORIENTATION : Vertical

WATER LEVELS : 32.4 ft below ground surface — START : 3/9/07 08:15 — END : 3/12/07 12:00 — LOGGER : R. Calimer

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	55.8		3	Fractures, medium rough, dark brown staining, gently to moderate dipping , wide to narrow separation		**Gneiss*** soft to medium soft, fine sand to coarse sand, slightly weathered, bluish gray (Gley 2 6/1 10B) when it was wet, light bluish gray (Gley 2 8/1 5B) when it was dry, close to very close spacing	No water return
	R1NQ 4.6 ft 96%	58	2	medium rough, steeply dipping			3 min 28 sec /ft
			3				3 min 21 sec /ft
			3				3 min 15 sec /ft, UCS = 7470 psi
60							2 min 56 sec /ft
162.3	60.4		1				1 min 58 sec /ft
			1	medium rough, dark brown & orange brown staining, wide to narrow separation			2 min 11 sec /ft
			8				2 min 55 sec /ft
	R2NQ 5.1 ft 98%	52	3	Fracture, medium rough, black & orange brown staining, near vertical, fracture, narrow			3 min 17 sec /ft
			5				3 min 29 sec /ft
65							
157.3	65.5		3				4 min 45 sec /ft
			7	medium rough, black & orange brown staining, very thinly infilled, narrow to wide spare vertical fracture			2 min 55 sec /ft
			5				2 min 54 sec /ft
	R3NQ 5.1 ft 103%	31	3	Fracture, dark brown & orange brown staining, steeply dipping			3 min 10 sec /ft
			4				3 min 6 sec /ft
70							
152.3	70.6		10+	vertical & moderate dipping fractures, tight			4 min 20 sec /ft
						Bottom of Boring at 70.6 ft below ground surface on 3/12/07 12:00	Note: 1. Water was 32'7" bgs at 13:30 on 3/12/2007 2. Water was 32'5" bgs on 3/13/2007 and cave in at 42' bgs
75							
147.3							
80							
142.3							
85							
137.3							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-14 SHEET 1 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463088.8 N, 1281641.2 E)

ELEVATION : 221.2 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 32.4 ft below ground surface START : 3/12/07 14:11 END : 3/13/07 13:00 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
221.2	0.0						
	1.0	12.0	S1SS	2-2	**Silt * (ML)** brown, moist, medium stiff, low plasticity, trace sand, rock fragments, and organics, white powdery substance at 1-2' (fill)		PP=1.25 tsf
	2.0	12.0	S2SS	4-4			PP=1.0 tsf
	3.0	9.0	S3SS	4-5	**Clayey Silt * (ML)** brown, moist, medium stiff, low plasticity, trace mica		
	4.0	8.0	S4SS	4-6			
5	5.0	0.0	S5SS	7-7			
216.2	6.0	6.0	S6SS	7-9	**Sandy Silt * (ML)** tan brown, moist, stiff, low to non plasticity, trace rock fragments		PP=1.5 tsf
	7.0	5.0	S7SS	8-6			PP=0.25 tsf (breaks)
	8.0	7.0	S8SS	9-10	**Silty Sand (SM)** tan brown, moist, loose, fine to medium grained, trace brick fragements (fill)		
	9.0	10.0	S9SS	3-5			
10	10.5	15.0	S10SS	8-3-3 (6)	coarse gravel, trace clay		
211.2	13.5						Note: Split spoon was sampled every 1 ft for top 10 ft due to Unexploded Ordnance (UXO) check. UXO was performed every 1 ft from 0 to 10 ft and at 13.5, 18.5, and 23.5 ft. No UXO interference was detected. No elevated Photo Ionisation Detector (PID) readings.
15	15.0	12.0	S11SS	7-9-12 (21)	**Silty Sand * (SM)** tan brown, moist, medium dense, fine to medium grained, nonplastic, trace rock fragments, trace mica (native)		
206.2	18.5						
	18.9	11.0	S12SS	50/5 (50/5")	**Silty Sand (SM)** tan brown, moist, very dense, fine to medium grained, nonplastic, partially weathered rock		Sand=70.8%, fines=29.2%
20							
201.2	23.5						
	24.4	11.0	S13SS	26-50/5 (50/5")			
25							
196.2	28.5						
	29.3	10.0	S14SS	40-50/4 (50/4")			
30							

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-14 SHEET 2 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463088.8 N, 1281641.2 E)

ELEVATION : 221.2 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 32.4 ft below ground surface START : 3/12/07 14:11 END : 3/13/07 13:00 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
191.2					**Silty Sand * (SM)** tan brown, moist, very dense, fine to medium grained, nonplastic, partially weathered rock		
33.5							
33.8	4.0	4.0	S15SS	50/4 (50/4")			
35 186.2							
38.5							
38.6	1.0	1.0	S16SS	50/1 (50/1")	**Sandy Silt * (ML)** tan brown, moist, hard, fine to medium grained, nonplastic, few rock fragments		
40 181.2							
43.5							
43.6	1.0	1.0	S17SS	50/1 (50/1")			
45 176.2							
48.5							
48.6	1.0	1.0	S18SS	50/1 (50/1")			
50 171.2							
53.5							
53.6	1.0	1.0	S19SS	50/1 (50/1")			
55 166.2							
58.5							
58.7	2.0	2.0	S20SS	50/2 (50/2")	wet, some rock fragments		
60							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-14 SHEET 3 OF 4

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463088.8 N, 1281641.2 E)

ELEVATION : 221.2 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 32.4 ft below ground surface START : 3/12/07 14:11 END : 3/13/07 13:00 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
161.2							
	62.2						Auger refusal at 62.2 ft bgs
					Begin Rock Coring at 62.2 ft below ground surface See the next sheet for the rock core log		
65 156.2							
70 151.2							
75 146.2							
80 141.2							
85 136.2							
90							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
339179.RD.FI	BH-14	SHEET 4 OF 4

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design — LOCATION : (463088.8 N, 1281641.2 E)

ELEVATION : 221.2 ft — DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING EQUIPMENT AND METHOD : ATV, CME 55, NQ size double tube core barrel — ORIENTATION : Vertical

WATER LEVELS : 32.4 ft below ground surface — START : 3/12/07 14:11 — END : 3/13/07 13:00 — LOGGER : R. Calimer

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
62.2							
	R1NQ 3.8 ft 88%	44	4	medium rough, brown staining, moderate dipping, thin silt & sand infilling, narrow to wide separation		**Gneiss*** medium soft, fine sand to coarse sand, slightly weathered to moderately weathered, bluish gray (Gley 2 5/1 10B) when it was wet, light bluish gray (Gley 2 8/1 5B), when it was dry, close to very close spacing 64.6'-65.2' highly weathered, soft	2 min 45 sec /ft
			3				
65			5				2 min 36 sec /ft, UCS = 4888 psi
156.2							2 min 51 sec /ft
66.0				Mechanical break, brown & orange brown staining			3 min 20 sec /ft
	R2NQ 4.6 ft 98%	67	9				
			2	very steeply dipping fracture			2 min 50 sec /ft
			2				3 min 09 sec /ft
			4				2 min 35 sec /ft
70							
151.2			2				
70.6							
			4				3 min 25 sec /ft
			3				3 min 10 sec /ft
	R3NQ 4.6 ft 107%	78	2				3 min 40 sec /ft
			2				2 min 53 sec /ft
75			2				1 min 35 sec /ft
146.2							2 min 49 sec /ft
75.2			3				
	R4NQ 2 ft 100%	58	3				3 min /ft
77.2							
						Bottom of Boring at 77.2 ft below ground surface on 3/13/07 13:00	Note: 1. Water was 35'6" bgs, cave in at 61' on 3/13/2007 14:45 2. Water was 32'5" bgs, cave in at 60' on 3/14/2007 13:00
80							
141.2							
85							
136.2							
90							
131.2							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-15 SHEET 1 OF 3

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463174.8 N, 1281650.8 E)

ELEVATION : 220.1 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 34.0 ft below ground surface START : 3/13/07 15:15 END : 3/14/07 12:05 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
220.1	0.0						
	1.0	9.0	S1SS	1-3	**Clayey Silt * (ML)** brown, moist, medium stiff, low plasticity, trace sand , rock fragments,and organics (fill)		PP=1.0 tsf
	2.0	6.0	S2SS	50/6			
	3.0	12.0	S3SS	3-5	**Sandy Silt * (ML)** tan brown, moist, stiff to very stiff, nonplastic, few rock fragments, trace mica (fill)		
	4.0	11.0	S4SS	7-8			
5	5.0	4.0	S5SS	6-7	few clay , quartz gravel		
215.1	6.0	10.0	S6SS	6-5			
	7.0	7.0	S7SS	2-5	**Sandy Silt (ML)** red brown, moist, medium stiff to stiff, low plasticity, trace rock fragments, trace brick fragments few clay (fill)		PP=1.75 tsf, Sand=43.4%, Silt=50.2%, Clay=6.4%, LL=30, PL=27, PI=3
	8.0	10.0	S8SS	4-4			
	9.0	12.0	S9SS	2-2			PP=0.25 tsf
10		13.0	S10SS	1-2-3 (5)			PP=1.0 tsf
210.1	10.5						
	13.5						Note: Split spoon was sampled every 1 ft for top 10 ft due to Unexploded Ordnance (UXO) check. UXO was performed every 1 ft from 0 to 10 ft and at 13.5, 18.5, and 23.5 ft. No UXO interference was detected. No elevated Photo Ionisation Detector (PID) readings.
	15.0	15.0	S11SS	4-4-4 (8)	**Silty Sand * (SM)** tan brown, (tan brown), moist, loose, very fine to fine grained, trace rock fragments		
15							
205.1	18.5						
	19.9	17.0	S12SS	14-32-50/5 (82/11")	**Sandy Silt * (ML)** tan brown, moist, hard, nonplastic, few rock fragments		
20							
200.1	23.5						
	24.2	8.0	S13SS	40-50/2 (50/2")	trace rock fragments		
25							
195.1	28.5						
	28.9	5.0	S14SS	50/5 (50/5")			
30							

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-15 SHEET 2 OF 3

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463174.8 N, 1281650.8 E)

ELEVATION : 220.1 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : ATV, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 34.0 ft below ground surface START : 3/13/07 15:15 END : 3/14/07 12:05 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
190.1					**Sandy Silt * (ML)** tan brown, moist, hard, nonplastic		
33.5							
33.8	4.0	S15SS		50/4 (50/4")			
35 185.1							
38.5							
39.0	6.0	S16SS		50/6	wet		
40 180.1							
43.5							
43.6	1.0	S17SS		50/1 (50/1")			grinding from 45' to 48.5'
45 175.1							
48.5							Auger refusal at 48.7 ft bgs
48.7	0.0	S18SS		50/0	Begin Rock Coring at 48.7 ft below ground surface See the next sheet for the rock core log		
50 170.1							
55 165.1							
60							

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-15 SHEET 3 OF 3

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design — LOCATION : (463174.8 N, 1281650.8 E)

ELEVATION : 220.1 ft — DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING EQUIPMENT AND METHOD : ATV, CME 55, NQ size double tube core barrel — ORIENTATION : Vertical

WATER LEVELS : 34.0 ft below ground surface — START : 3/13/07 15:15 — END : 3/14/07 12:05 — LOGGER : R. Calimer

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
48.7							
50	R1NQ 2.2 ft 87%	68	1	Fracture, medium rough, dark brown and orange brown staining, gently to modrate dipping, very thinly filled with sand, narrow separation		**Gneiss *** soft to hard, medium sand to coarse sand, slightly weathered, greenish gray (Gley 1 5/1 10Y) when it was wet, white (Gley 1 8/N) when it was dry, close to moderate close spacing	2 min 41 sec/ft
170.1			1				2 min 40 sec/ft, UCS = 6522 psi
50.9							
	R2NQ 5 ft 100%	90	2				2 min 40 sec/ft
			2				2 min 55 sec/ft
			1				
55			1				
165.1			2				3 min 16 sec/ft
55.9							
	R3NQ 5 ft 92%	70	1				
			3				
			1				2 min 56 sec/ft
			4				2 min 39 sec/ft
60			1				2 min 42 sec/ft
160.1							
60.9							7 min for run R4
	R4NQ 2.8 ft 98%	74	3				
			3				
			2				
63.7							
						Bottom of Boring at 63.7 ft below ground surface on 3/14/07 12:05	Note: 1. Water was 30'7" bgs, cave in at 55'4" on 3/14/2007 13:05 2. Water was 34' bgs, cave in at 51'10" on 3/15/2007 08:00
65							
155.1							
70							
150.1							
75							
145.1							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-16 SHEET 1 OF 3

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463235.5 N, 1281665.7 E)

ELEVATION : 219.9 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : Truck Mounted, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 36.5 ft below ground surface START : 3/19/07 07:30 END : 3/19/07 10:45 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
219.9	0.0						
	1.0	12.0	S1SS	2-4	**Silt * (ML)** brown, moist, low plasticity, trace organics, trace sand & rock fragments (fill)		PP=1.0 tsf
	2.0	7.0	S2SS	4-8			
	3.0	8.0	S3SS	20-27	**Sandy Silt * (ML)** tan brown, moist, nonplastic, trace rock fragments, trace mica (fill)		PP=0.0 tsf (non cohesive)
	4.0	7.0	S4SS	26-12	wood fragments at 3.5ft		
5	5.0	3.0	S5SS	8-7	few gravels		
214.9	6.0	7.0	S6SS	6-6			
	7.0	7.0	S7SS	4-4	trace clay		PP=0.75
	8.0	6.0	S8SS	6-5			
	9.0	12.0	S9SS	3-6			
10					**Sandy Silt (ML)**		Sand=31.4%, Silt=57.8%, Clay=10.8%
209.9	10.5	11.0	S10SS	5-5-5 (10)	brown, moist, low plasticity, few clay, trace few sand & rock fragments (fill)		LL=31 , PL=19 , PI=12
	13.5						Note: Split spoon was sampled every 1 ft for top 10 ft due to Unexploded Ordnance (UXO) check. UXO was performed every 1 ft from 0 to 10 ft and at 13.5, 18.5, and 23.5 ft. No UXO interference was detected. No elevated Photo Ionisation Detector (PID) readings. Chloride=13 ppm, pH=4.1, Resistivity=13700 ohm-cm, Sulfate=45 ppm.
15	15.0	14.0	S11SS	15-18-18 (36)	**Silty Sand* (SM)** tan brown, wet, dense, very fine to medium grained, trace rock fragments, partially weathered rock		
204.9	18.5						
	19.3	10.0	S12SS	30-50/4 (50/4")	very dense		
20							
199.9	23.5						
	23.7	3.0	S13SS	50/3 (50/3")			
25							
194.9	28.5						
	29.3	10.0	S14SS	41-50/4 (50/4")			
30							

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-16 SHEET 2 OF 3

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (463235.5 N, 1281665.7 E)

ELEVATION : 219.9 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : Truck Mounted, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : 36.5 ft below ground surface START : 3/19/07 07:30 END : 3/19/07 10:45 LOGGER : R. Calimer

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
189.9					**Silty Sand* (SM)** tan brown, wet, dense, very fine to medium grained, trace rock fragments, partially weathered rock		
33.5							
33.8	4.0		S15SS	50/4 (50/4")			
35 184.9							
38.5							
38.6	1.0		S16SS	50/1 (50/1")			
40 179.9							
43.5							
43.6	1.0		S17SS	50/1 (50/1")			
45 174.9							
48.5							
48.6			S18SS	50/1 (50/1")			Auger refusal at 50 ft bgs.
50	50.0						
169.9					Begin Rock Coring at 50.0 ft below ground surface See the next sheet for the rock core log		
55 164.9							
60							

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	BH-16 SHEET 3 OF 3

ROCK CORE LOG

PROJECT : Washington Aqueduct Residuals Design
LOCATION : (463235.5 N, 1281665.7 E)

ELEVATION : 219.9 ft
DRILLING CONTRACTOR : Froehling and Robertson, Inc.

CORING EQUIPMENT AND METHOD : Truck Mounted, CME 55, NQ size double tube core barrel
ORIENTATION : Vertical

WATER LEVELS : 36.5 ft below ground surface
START : 3/19/07 07:30
END : 3/19/07 10:45
LOGGER : R. Calimer

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R.Q.D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
169.9	50.0		2	medium rough, black and orange brown, gentely to moderate dipping, narrow to wide separation		**Gneiss*** very soft to medium soft, moderately weathered to slightly weathered, greenish gray (Gley 1 5/1 10Y) when it was wet, greenish gray (Gley 1 8/1 10Y) when it was dry, fine to coarse graind, close spacing 53.4'-53.6' highly to completely weatthered	3 min/ft
			5				2 min 43 sec/ft
	R1NQ 5 ft 97%	52	2	Joint, very steeply dipping			2 min 40 sec/ft, UCS = 4048 psi
			1				3 min 20 sec/ft
55			4				3 min 10 sec/ft
164.9	55.0		3	tight to wide separation		medium soft to hard, slightly weathered to moderately weathered, bluish gray (Gley 2 2/6 10 B) when it was wet, light bluish gray (Gley 2 8/1 10B) when it was dry	2 min 50 sec/ft
			3				3 min 34 sec/ft, UCS = 8868 psi
	R2NQ 4.8 ft 104%	71	3				3 min 30 sec/ft
			2				3 min 10 sec/ft
			3				3 min 17 sec/ft
60	59.8						
159.9			2	narrow to tight		medium soft to hard	3 min 25 sec/ft
			3	60'7" to 61' 5", near vertical fractures			3 min 25 sec/ft
	R3NQ 5 ft 102%	77	2				3 min 20 sec/ft
			1	Mechanical break			3 min 30 sec/ft
			1				3 min 50 sec/ft
65	64.8						
154.9						Bottom of Boring at 64.8 ft below ground surface on 3/19/07 10:45	3/20/07, 07:40 cave in at 47.5' , water at 36.5'
							Water at 36.5 ft, cave-in at 47.5 ft, 3/20/2007 07:40
70							
149.9							
75							
144.9							
80							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	GCP-5 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (454589.5 N, 1285018.1 E)

ELEVATION : 134.7 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : Truck Mounted, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : --- START : 3/8/07 10:28 END : 3/8/07 11:30 LOGGER : X.Xia

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
134.7	0.0				**Grass Surface, Wet Surface**		
		6.0	S1SS	3-4-2-3 (6)	**Silt * (ML)** dark gray, wet, firm, a lot of rooflets		PP=2 tsf
	2.0						
		18.0	S2SS	1-2-9-15 (11)	yellowish brown & gray, damp to dry, stiff, fine grained		
	4.0						
5		24.0	S3SS	8-12-23-26 (35)	hard, trace of fine gravel & sand		PP=4.5+ tsf
129.7	6.0						
		24.0	S4SS	6-10-13-17 (23)	bluish gray & yellow, damp, very stiff, low plasticity, trace of gravel up to 0.5" in size, low cohesion		PP=4.5+ tsf, Chloride=13 ppm, pH=5.27, Resistivity=7610 ohm-cm, Sulfate=89 ppm.
	8.0						
		18.0	S5SS	5-7-10-16 (17)	**Sandy Silt * (ML)** gray & yellow, damp, very stiff, fine grained, low to medium plasticity		PP=4.5+ tsf
10	10.0						
124.7							grinding at 12'
	13.5						
		18.0	S6SS	7-15-21 (36)	**Poorly Graded Sand W/ Silt * (SP-SM)** yellowish brown w/ black, dry, dense, very fine grained		
15	15.0						
119.7							
	18.5						
	19.4	5.0	S7SS	29-50/5 (50/5")	damp to moist, very dense		tip separated from spoon, not much sample left
20							
114.7					Bottom of Boring at 19.9 ft below ground surface on 3/8/07 09:15		Note: 1. Water table was 18' bgs before augers pulled out 2. Temporary well was installed. Bottom of the temporary well is 19.9'bgs, about 10' of slotted zone at bottom 3. Water was at surface on 3/9/2007, which is possibly due to melted snow on the previous and the same day
25							
109.7							
30							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
339179.RD.FI	GCP-6	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design — LOCATION : (454557.1 N, 1285058.9 E)

ELEVATION : 148.9 ft — DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : Truck Mounted, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : --- — START : 3/9/07 07:45 — END : 3/9/07 09:50 — LOGGER : X.Xia

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
148.9	0.0				**Gravel Surface**		
	2.0	12.0	S1SS	10-11-6-7 (17)	**Silty Sand W/ Gravel * (SM)** gray brown, dry, medium dense, fine to medium gravel up to 1" in size (Fill)		
	4.0	12.0	S2SS	7-6-6-7 (12)	**Sandy Silt (ML)** yellowish brown, dry, stiff, trace of fine gravel (Fill)		Gravel=1.6% , Sand=30.5%, Fines=67.8%
5 143.9	6.0	12.0	S3SS	4-3-5-6 (8)	grayish brown, moist, stiff, nonplastic		
	8.0	10.0	S4SS	3-3-4-4 (7)	**Silt * (ML)** yellow & gray, moist to damp, fine grained, firm, cohesion less		PP=1 tsf
10 138.9	10.0	12.0	S5SS	2-2-3-4 (5)	**Clayey Sand (SC)** olive brown, moist, loose, few gravel		PP=0.8 tsf, Shell by tubes were taken from off set borehole from 8-10' and from 10' to 12'
	12.0	12.0	S6SS	1-2-3-3 (5)	fine to medium grained, orange staining (Fill)		Gravel=6.0%, sand=52.85%, fines=41.06%, LL=45% , PL=17 , PI=28, CU triaxial test: c'=102 psf, phi'=30.6 degree
	14.0	14.0	S7SS	1-2-3-4 (5)	**Sandy Silt (ML)** yellowish brown w/ black staining, moist to damp, firm, fine grained, (Fill)		Gravel=0%, sand =42.2%, fines=57.7% (12'-14')
15 133.9	16.0	14.0	S8SS	1-3-4-3 (7)	**Silt * (ML)** gray yellow, moist, fine grained, low to medium plasticity, firm, cohesionless (Fill)		
	18.0	18.0	S9SS	2-2-14-14 (16)	**Silty Sand * (SM)** grayish brown, moist, medium dense, fine sand, trace of fine gravel		PP=0.8 tsf
20 128.9	20.0	18.0	S10SS	9-13-17-24 (30)	**Sandy Silt * (ML)** brown & gray, dry, very stiff, fine grained, cohesion		
	23.5						
25 123.9	25.0	6.0	S11SS	12-18-22 (40)	**Silty Sand* (SM)** yellowish brown, damp to dry, dense, fine grained		grinding at 27'
	28.5						
30	30.0	16.0	S12SS	11-15-21 (36)	grayish brown /black staining		

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	GCP-6 SHEET 2 OF 2

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (454557.1 N, 1285058.9 E)

ELEVATION : 148.9 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : Truck Mounted, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : --- START : 3/9/07 07:45 END : 3/9/07 09:50 LOGGER : X.Xia

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
118.9					**Silty Sand* (SM)** yellowish brown, damp to dry, dense, fine to medium grained, partially weathered rock		
	33.5						
	34.7	12.0	S13SS	38-45-50/2 (95/8")	wet, fine to medium grain sand		
35							
113.9							spoon is wet
	38.5						
	39.0	4.0	S14SS	50/6	grayish brown, dry, very dense, fine grained		
40							
108.9							wet soil came out during drilling
	43.5 ~~43.6~~						
		0.0	S15SS	50/1 (50/1")	no recovery, some wet mud		significant bouncing
45							
103.9							
	48.5 ~~48.6~~						
		0.0	S16SS	50/1 (50/1")	Bottom of Boring at 48.6 ft below ground surface on 3/8/07 09:15		Note: 1. Rig pushing down pressure was about 500 psi when grinding 2. Auger refusal at 48.6 ft bgs. 3. Water was 34'6" before pulled out auger. 4, Water was 25.5' bgs after pulled out auger, cave in at 44.5'. 5. The hole was grouted from bottom up using trieme at the end of boring.
50							
98.9							
55							
93.9							
60							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	GPS-3 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (454227.9 N, 1284887.9 E)

ELEVATION : 147.4 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : Truck Mounted, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : --- START : 3/8/07 09:25 END : 3/8/07 10:00 LOGGER : X.Xia

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
147.4	0.0				**Grass Surface Coverd W/snow**		
	2.0	8.0	S1SS	5-11-22-21 (33)	**Sandy Silt * (ML)** brown to dark brown, damp to dry, hard, trace of gravel up to 1" in size, trace of rootlets (fill)		1" of gravel
	4.0	12.0	S2SS	8-12-12-12 (24)	**Silty Sand/sandy Silt * (SM/ML)** brown, dry, very stiff, medium dense, trace of gravel up to 0.5" (shining in sun), (fill)		
5 142.4	6.0	16.0	S3SS	3-5-7-9 (12)	**Silty Sand * (SM)** yellowish brown, damp to dry, medium dense, fine grained, trace of rooflets, homogeneous		
	8.0	18.0	S4SS	3-4-4-6 (8)	**Silt * (ML)** olive, damp to moist, medium plasticity, firm		PP=1.5 tsf
10	10.0	18.0	S5SS	3-4-4-6 (8)			PP=1.5 tsf
137.4	13.5				yellowish brown, damp, hard, medium to low plasticity		PP=4.5+ tsf
15	15.0		S6SS	9-12-19 (31)			
132.4					Bottom of Boring at 15.0 ft below ground surface on 3/8/07 10:00		Note: 1. No water was observed during drilling 2. Dry and cave in at 12' on 3/9/2007 11:30 am
20 127.4							
25 122.4							
30							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
339179.RD.FI	GPS-4 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Washington Aqueduct Residuals Design LOCATION : (454278.3 N, 1284895.2 E)

ELEVATION : 147.5 ft DRILLING CONTRACTOR : Froehling and Robertson, Inc.

DRILLING EQUIPMENT AND METHOD : Truck Mounted, CME 55, 2-1/4" ID HSA, 140 lb hammer with cathead, 2" OD Split Spoon

WATER LEVELS : --- START : 3/8/07 08:30 END : 3/8/07 09:15 LOGGER : X.Xia

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
147.5	0.0				**Gravel Surface Covered W/snow**		
	2.0	10.0	S1SS	10-5-7-11 (12)	**Silt Sand * (SM)** yellowish brown w/black, moist, medium dense, trace of gravel up to 1" in size, (fill)		
	4.0	18.0	S2SS	7-7-9-8 (16)	**Silt* (ML)** brown, gray, damp to dry, very stiff, (fill)		PP=3 tsf
5 142.5	6.0	18.0	S3SS	4-4-6-7 (10)	**Silty Sand/sandy Silt * (SM/ML)** yellowish brown, damp, stiff, loose, fine grained		
	8.0	5.0	S4SS	4-4-4-5 (8)	**Silty Sand * (SM)** yellowish brown, dry, loose, fine grained		
10 137.5	10.0	18.0	S5SS	2-2-3-4 (5)	**Silt * (ML)** yellowish brown, damp to moist, firm		PP=1.1 tsf
	13.5						
15 132.5	15.0	12.0	S6SS	30-17-23 (40)	**Poorly Graded Sand* (SP)** yellow, dry, dense, fine grained, trace of fine gravel Bottom of Boring at 15.0 ft below ground surface on 3/8/07 09:15		Note: 1. No water observered at drilling, cave in at 11.5' bgs after drilling 2. Dry and cave in at 11.5' bgs on 3/9/2007
20 127.5							
25 122.5							
30							